MOTOROLA

GSM 6700 / 8700

TRAINING - LEVEL III

High Tech. Centre - Flensburg
European Cellular Subscriber Division
Author: Michael Hansen / Technical Support

1 GENERAL 3

1.1 HW / SW 3

1.2 IC's 3

1.3 Frequency's 3

2 POINTS TO NOTE 4

2.1 Backhousing 4

2.2 Fronthousing 4

2.3 Main PCB 4

3 TOP XX FAILURE 5

3.1 Main PCB 5

3.2 Display PCB 6700 5

3.3 Display PCB 8700 5

1 GENERAL

1.1 HW / SW

Prod.	SW / HW	Version	Part.No
6700	3.6 / 1.3	78.63.23	SUF3997C
8700	3.6 /1.3	74.05.22	SUF3839G

1.2 IC's

Prefix / Name	Version	Note	Part.No
U703 / BIC	4.01	incl. AD / DA converter	5109743E13
U801 / SPC	11.80	AT&T	5199285C01
U501 / Modem	35.xx / 40.xx		5109632D42 / D49
U701 / Proc.	68338		5113802M40
U201 / GIF_SYN	--.--	IF / GUSS in one hsng.	5109632D64
U702 / SW	xxxx	with / without boot sector	5199245C30 / A01
U900 / GCAP	--.--		0109632D73

1.3 Frequency's

Location	Frequency (CH62)	Note
TX	902.4 MHz	
RX	947.4 MHz	
Ref. Osc.	13.0 MHz	
Main VCO	794.4 MHz	
TX Offset L-Osc.	216.0 MHz	Internal GIF_SYN - 108 MHz
RX L-Osc.	306.0 MHz	Internal GIF_SYN - 153 MHz

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2 Points to Note

2.1 Backhousing

Be sure that the pad against vibration from T900 is mounted.

2.2 Fronthousing

Be sure that the GND pads are in the right position. (especially close to the antenna). Sometimes they are not in right position and make shortages to the antenna switch. (No TX)

Sometimes the vibra is not in the right position. (it makes some noise to the housing)

If the housing got twisted sometimes the loudspeaker makes bad noise.

Be sure that the alert has the right polarisation.

2.3 Main PCB

The first revision of 8700 were built with two types of displays C04 / C05. Both types have there own programming in the EE prom of the main board. If you want to use another type of display you have to send the main PCB to the responsible national HUB support or to the HTC for reprogramming the EE-Prom.

Follow DB034 to do the GCAP-Fix. ((only up to and incl. print rev. r09)(Four changes on main PCB 6700 /8700 and two changes on the display board 6700),(only up to and incl. print rev. r09)) additional you have to remove C905 up to and incl. print rev. R13.

If you remove or replace a shield be sure that the shield is mounted in the right direction.

3 Top XX Failure

3.1 Main PCB

Bad RX / TX.	>>>	caused by a shortage between L304 and the shielding (first shield on the RF side close to the antenna A1) done by replacing the shield by service or mounting by production.
The radio turns off after seconds.	>>>	Y 201 is defective.
If you replace the crystal to another type [e.g. J04 □ , to J07○] you have to change also the capacitor C203.	>>> >>>	Y201 4809813J04 - C203 2113740F41 Y201 4809813J07 - C203 2113740F49
The radio doesn't turn on.	>>>	GCAP defective caused by not done fix.
----------	>>>	VR 604 is defective. Often together with the GCAP.
The radio turns off after seconds or minutes.	>>>	in the first revision C831, C901,C906 and C916 (orange cap.) are sometimes placed in the wrong direction.
No automatically audio switching in DHFA to HF mode.	>>>	In print revision r03 up to and include r05 is a wire fix in the DSC_EN_B line with sometimes bad soldering.
T900 mechanical defective.		

3.2 Display PCB 6700

Failures are unknown.

3.3 Display PCB 8700

Failures are unknown.

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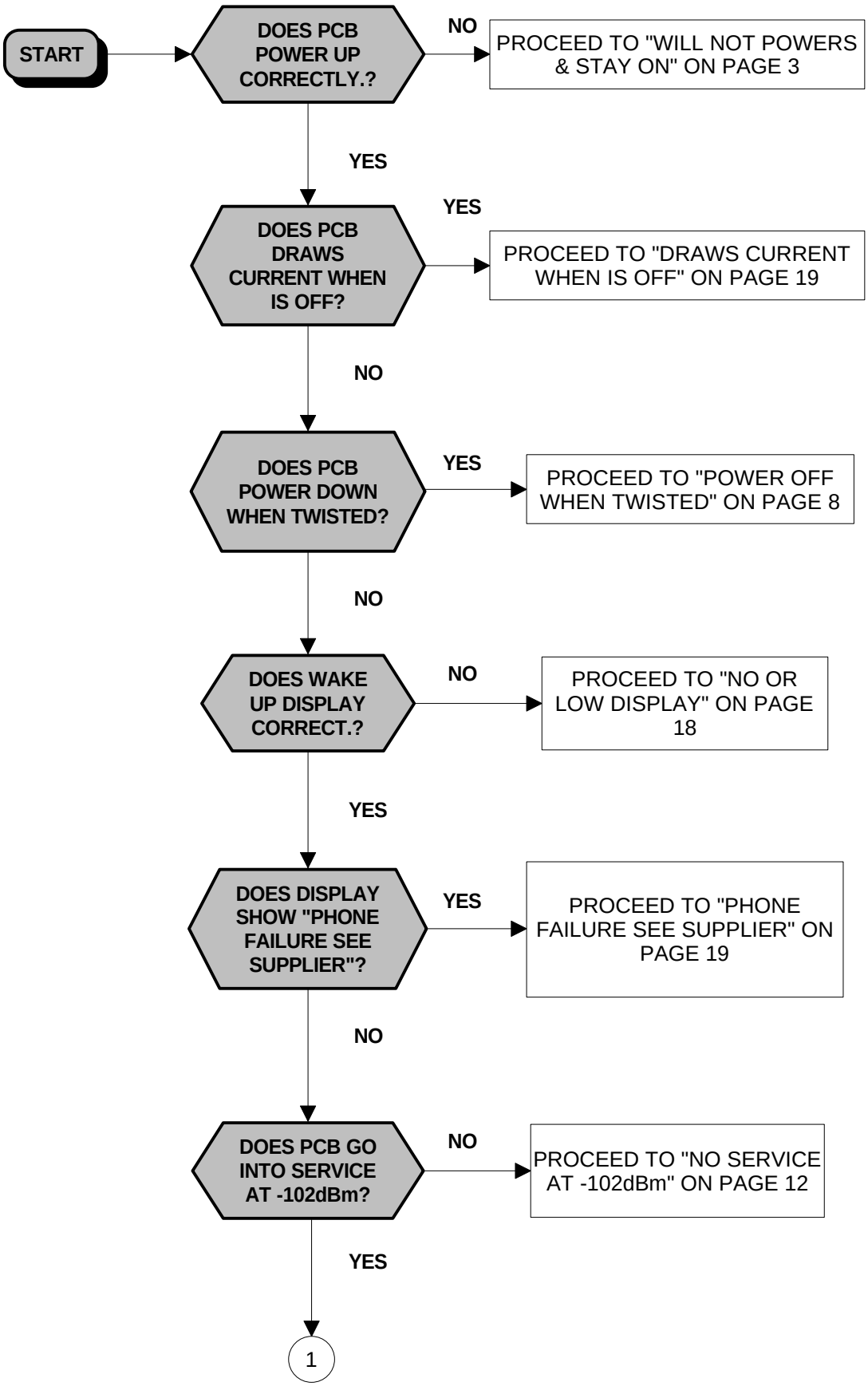
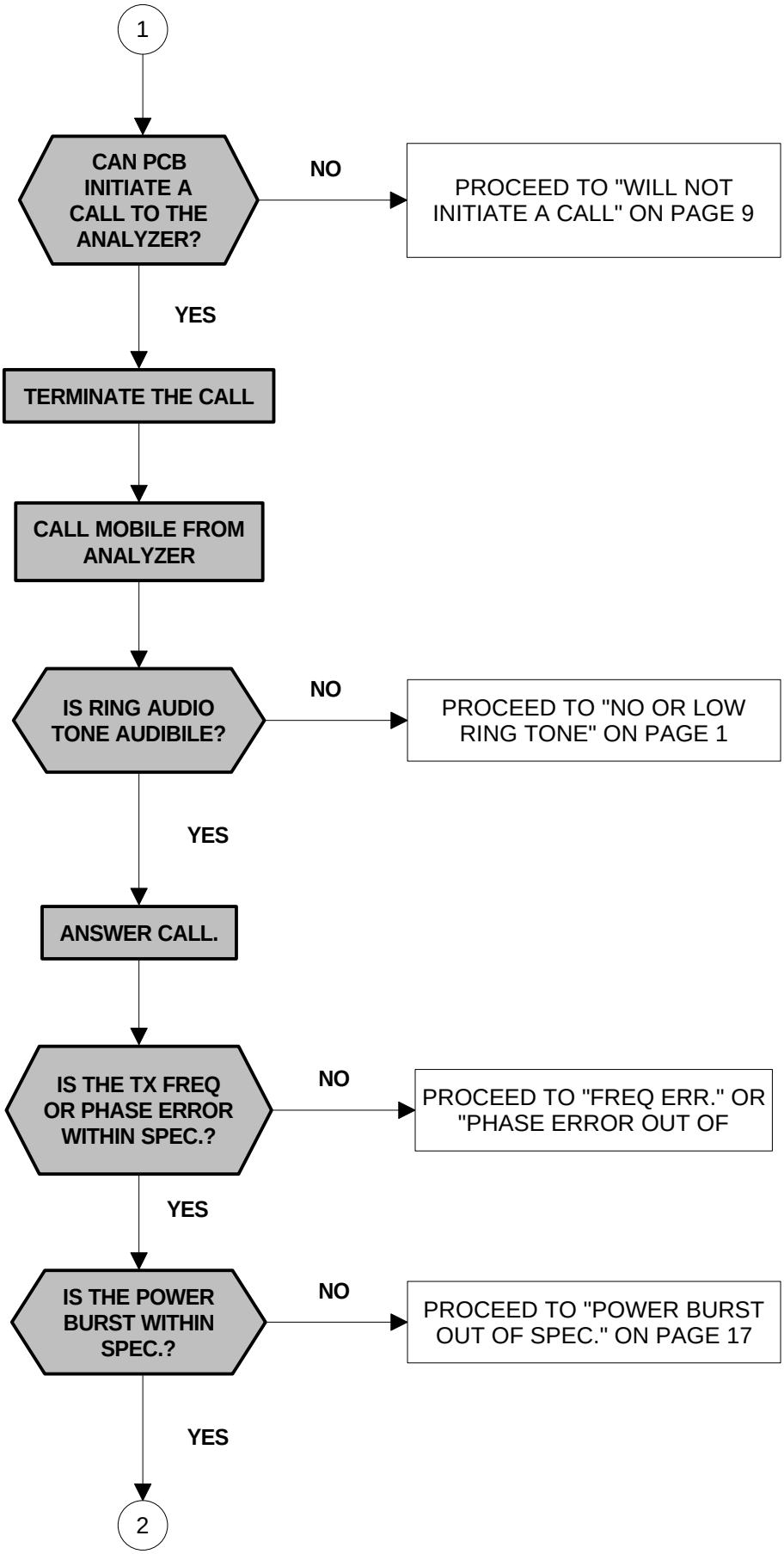
MicroTac Accessories Matrix

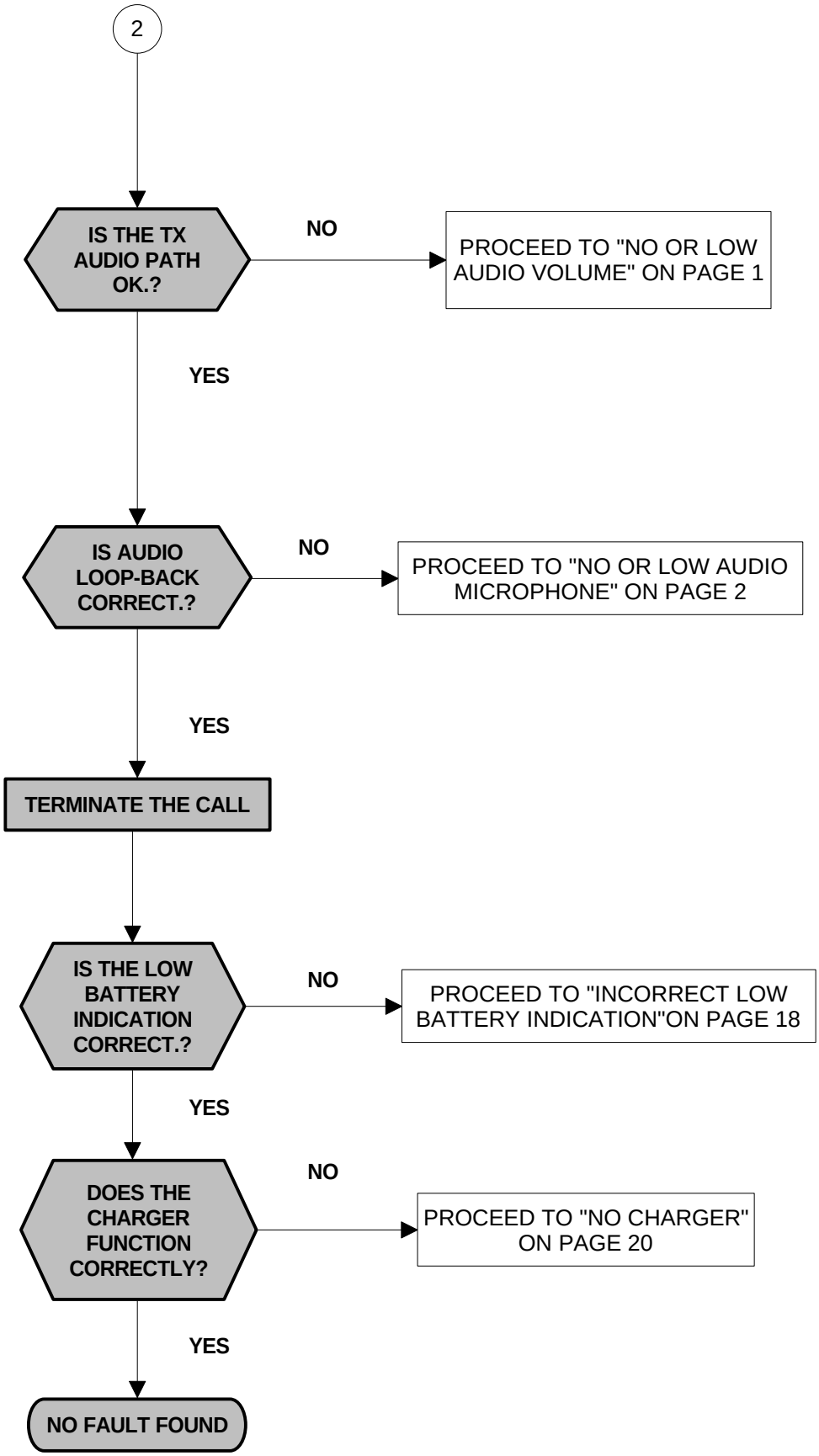
Europe, Middle East & Africa
Customer Services
Level 1 & 2 Authorised

Compatibily Matrix

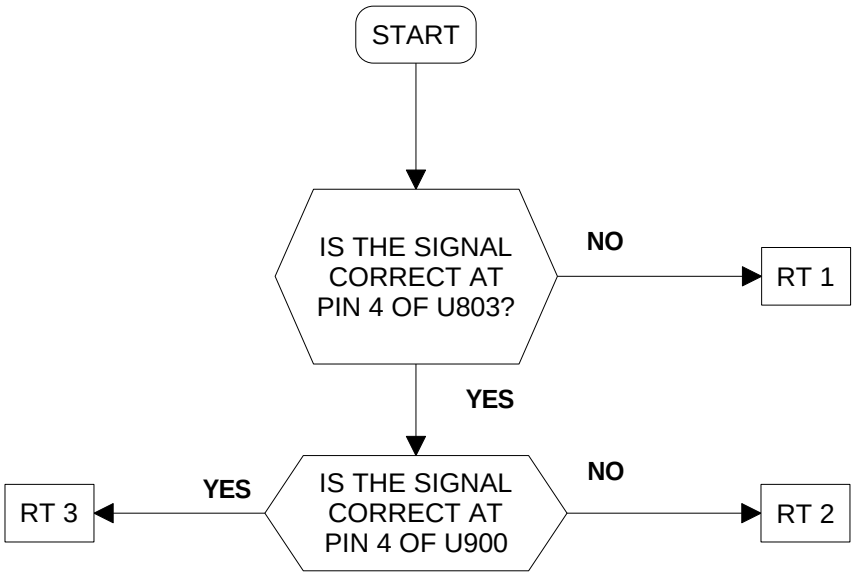
MicroTAC			Part Numbers to order								
			5200/ 7200 GSM 900	7500 GSM 900	6200 GSM 900	8200 GSM 900	8400 GSM 900	8700 GSM 900	d400 Series GSM 900	Flare GSM 1800	c400 Series GSM 1800
Normal Batteries	Lilon	400mAh Slim Battery	(SNN4554) - E*P Charger Only								
		100mAh Slim XCap Battery	(SNN4697) - E*P Charger Only								
		1200mAh XCap Battery	64615 (SNN4458) - E*P Charger Only								
	NiMh	600mAh XSlim Battery	64620 (SNN4612)								
		750mAh Slim XCap Battery	64621 (SNN4310)								
		1300mAh XCap Battery	64619 (SNN4259)								
		1600mAh High Capacity Battery	(SNN4824)								
	NiCd	400mAh Slim Battery	64618 (SNN4132)								
		600mAh Slim Battery	64630 (SNN4102)								
		1100mAh XCap Battery	64617 (SNN4058)								
Batteries with Clip	NiCd	400mAh XSlim Battery w/clip	(SNN4564)								
	NiMh	600mAh XSlim Battery w/clip	(SNN4887)								
Chargers		E*P Charger Base	64606 (SPN4462)								
		E*P Euro adaptor			64604 (SPN4222)						
		E*P UK adaptor			64605 (SPN4221)						
		Overnight Charger Base & Transformer	(S6334)								
		IntelliCharger XT w/Euro	64608 (SPN4463 + SPN4112) - Non Lilon compatible								
		IntelliCharger XT w/UK	64609 (SPN4463 + SPN4111) - Non Lilon compatible								
In-Car Accessories		Battery Saver	6407(SKN4292)								
		Ultra Saver (no RF connection)			64610 (SLN9933)						
		Ultra Saver with RF connection for 8000/Flare	(SLN9934)								
		Phone Cradle	64629 (SYN4932 + TRN5502)								
		Headset + Adapter						Available soon			
		Professional Charger Car Kit	(S3060)								
Car Kits		Basic Car Kit 7000	64628(SKN4292 ,SYN4932, TRN5502)								
		Basic Car Kit 8000/c400 Series			64627 (SLN9934 + SYN4932 + TRN5502)						
		Professional Hands-free Car Kit	(S5619)								
		Professional DSP Hands-free Car Kit			Available soon						
		User install Hands-free Car Kit			Available soon						
Carry Accessories		Executiv Holster - Leather	64613(SLN8500)								
		Executiv Holster - Leather			(SYN6198)						
		Sports Holster - Synthetic			(SYN6457)						


START
DOES PCB POWER UP CORRECTLY.?
NO
PROCEED TO "WILL NOT POWERS & STAY ON" ON PAGE 3
YES
DOES PCB DRAWS CURRENT WHEN IS OFF?
YES
PROCEED TO "DRAWS CURRENT WHEN IS OFF" ON PAGE 19
NO
DOES PCB POWER DOWN WHEN TWISTED?
YES
PROCEED TO "POWER OFF WHEN TWISTED" ON PAGE 8
NO
DOES WAKE UP DISPLAY CORRECT.?
NO
PROCEED TO "NO OR LOW DISPLAY" ON PAGE 18
YES
DOES DISPLAY SHOW "PHONE FAILURE SEE SUPPLIER"?
YES
PROCEED TO "PHONE FAILURE SEE SUPPLIER" ON PAGE 19
NO
DOES PCB GO INTO SERVICE AT -102dBm?
NO
PROCEED TO "NO SERVICE AT -102dBm" ON PAGE 12
YES
1


1
CAN PCB INITIATE A CALL TO THE ANALYZER?
NO
PROCEED TO "WILL NOT INITIATE A CALL" ON PAGE 9
YES
TERMINATE THE CALL
CALL MOBILE FROM ANALYZER
IS RING AUDIO TONE AUDIBILE?
NO
PROCEED TO "NO OR LOW RING TONE" ON PAGE 1
YES
ANSWER CALL.
IS THE TX FREQ OR PHASE ERROR WITHIN SPEC.?
NO
PROCEED TO "FREQ ERR." OR "PHASE ERROR OUT OF
YES
IS THE POWER BURST WITHIN SPEC.?
NO
PROCEED TO "POWER BURST OUT OF SPEC." ON PAGE 17
YES
2


2
IS THE TX AUDIO PATH OK.?
NO
PROCEED TO "NO OR LOW AUDIO VOLUME" ON PAGE 1
YES
IS AUDIO LOOP-BACK CORRECT.?
NO
PROCEED TO "NO OR LOW AUDIO MICROPHONE" ON PAGE 2
YES
TERMINATE THE CALL
IS THE LOW BATTERY INDICATION CORRECT.?
NO
PROCEED TO "INCORRECT LOW BATTERY INDICATION"ON PAGE 18
YES
DOES THE CHARGER FUNCTION CORRECTLY?
NO
PROCEED TO "NO CHARGER" ON PAGE 20
YES
NO FAULT FOUND

NO OR LOW RING TONE

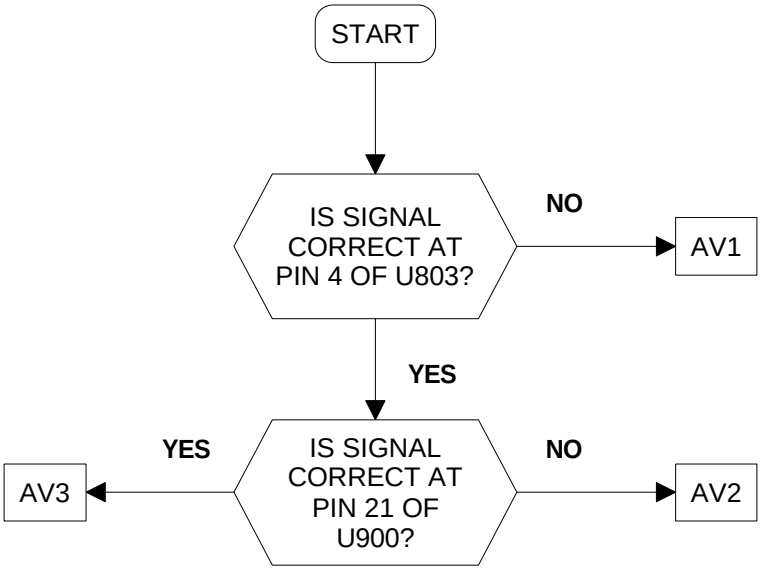


RT1: CHECK IF U801 IS POSITIONED CORRECTLY OR BAD SOLDER, IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U801

RT2: CHECK IF U802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER ALSO CHECK C825,C817 AND R803. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803

RT3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 4.5.6.7, CHECK ALSO PIN CONNECTOR 5.7 OF J2. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO VOLUME

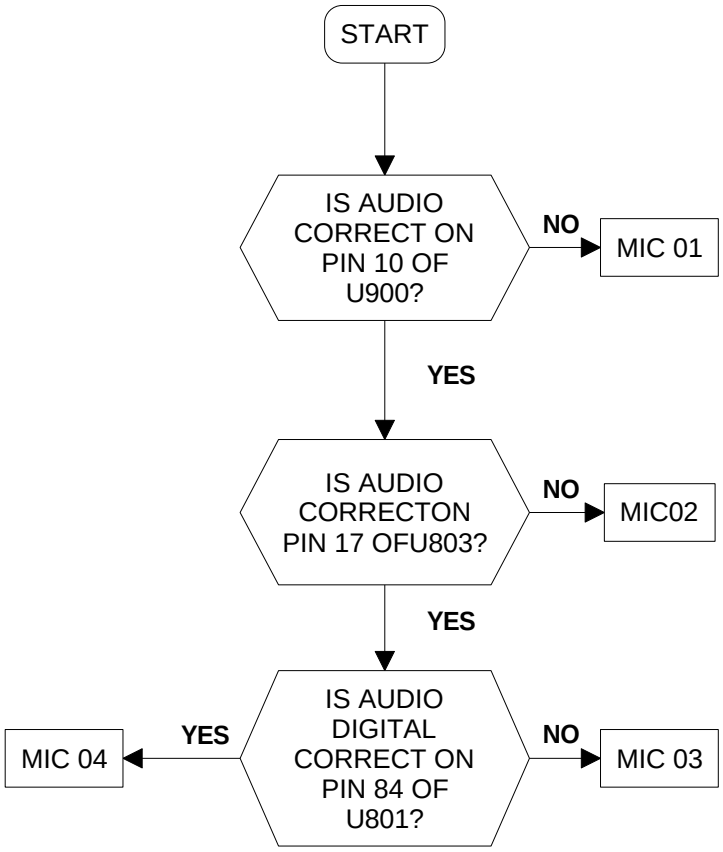


AV1: CHECK IF U801 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV2: CHECK IFU802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER, ALSO CHECK C825 AND R810. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 19.20.21, PIN CONNECTOR 22.20 OF J2 AND R802,R810,C804 AND C825. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO MICROPHONE



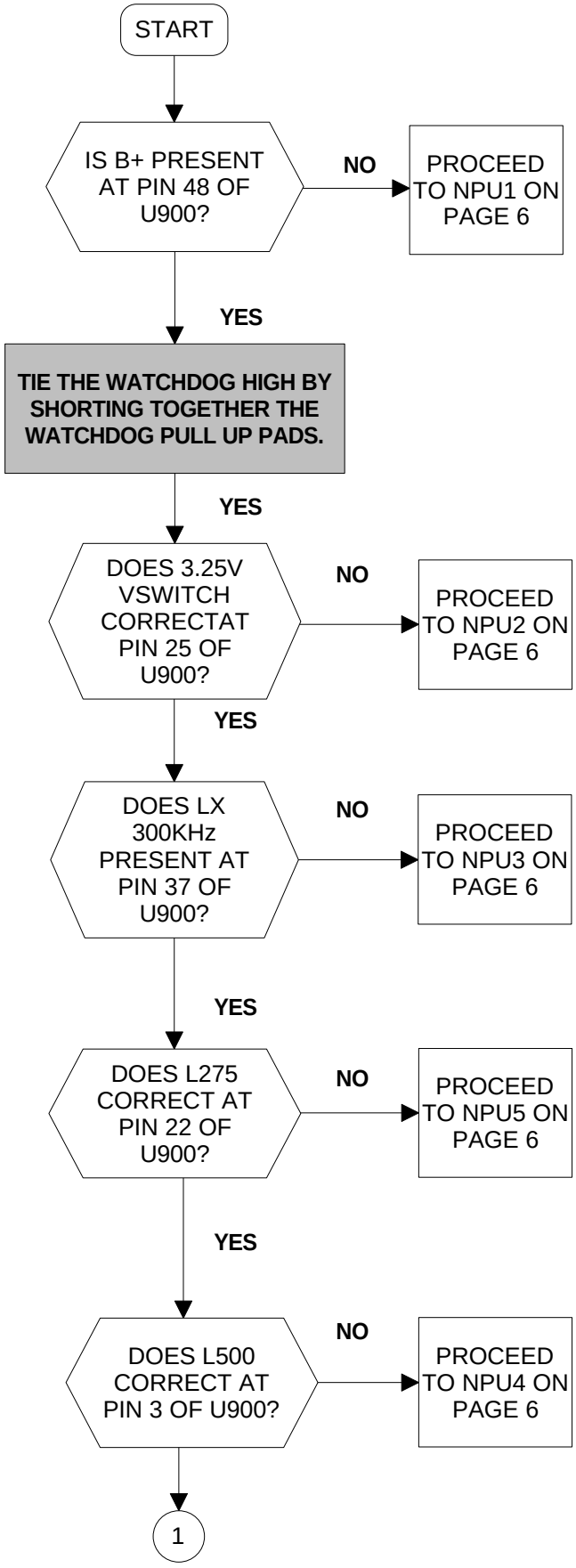
MIC 01: CHECK J802, C810, C813, C808, R806, R805 FOR BAD SOLDER.

MIC02: CHECK VOLTAGE ON PIN 17/18/19/20 OF U803, IS ABOUT 2.4V, IF IS NOT CORRECT REPLACE C832 AND C848; IF IS CORRECT CHECK U900 AND AFTER REPLACE IT.

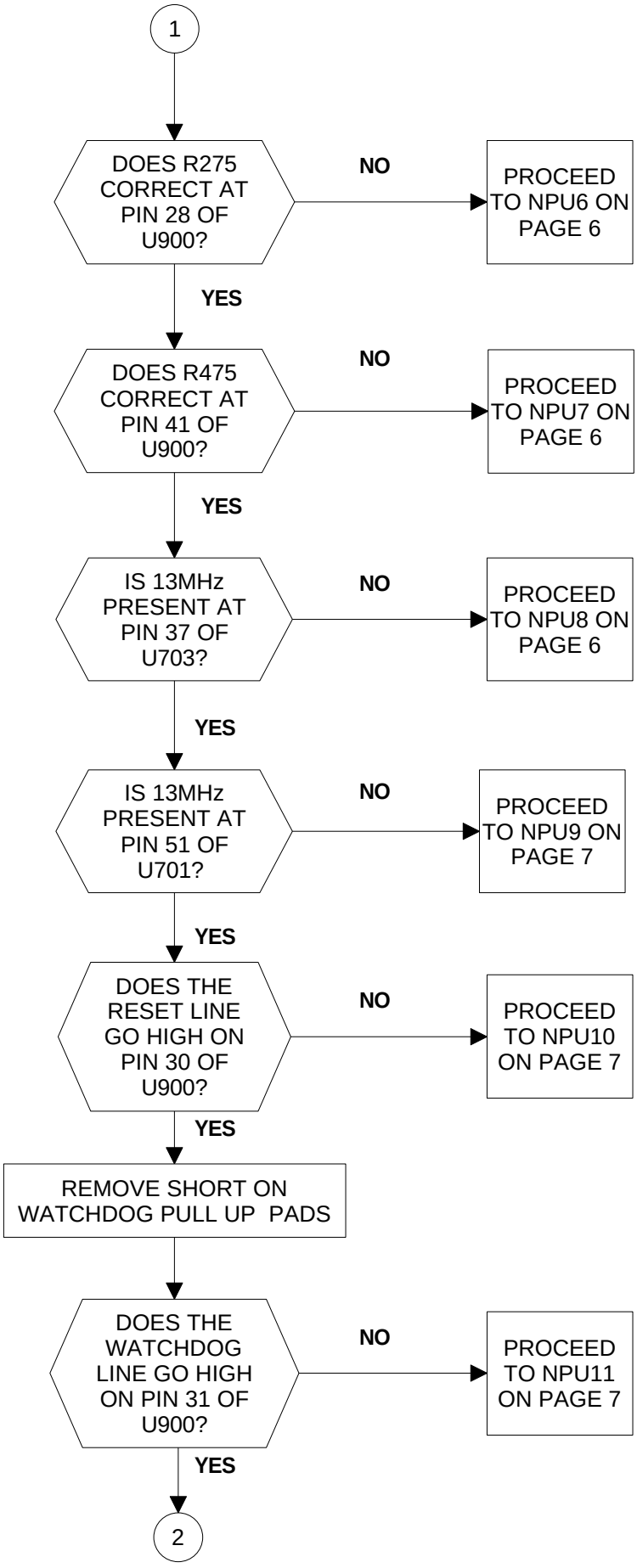
MIC 03: CHECK IF U803 AND R838, R842, R841 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U803.

MIC 04: CHECK IF U801 AND R845 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U801.

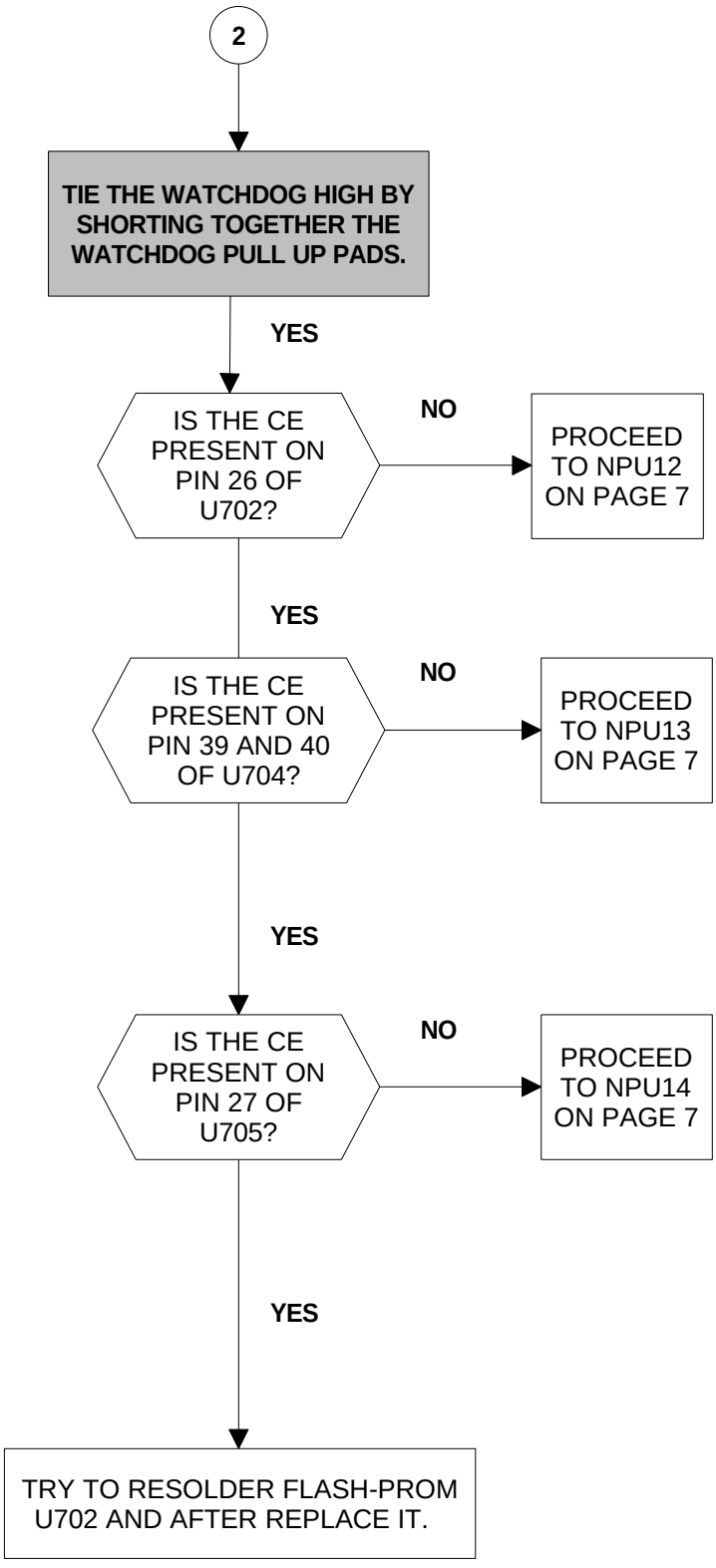
WILL NOT POWERS UP & STAY ON


START
IS B+ PRESENT AT PIN 48 OF U900?
NO
PROCEED TO NPU1 ON PAGE 6
YES
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
DOES 3.25V VSWITCH CORRECTAT PIN 25 OF U900?
NO
PROCEED TO NPU2 ON PAGE 6
YES
DOES LX 300KHz PRESENT AT PIN 37 OF U900?
NO
PROCEED TO NPU3 ON PAGE 6
YES
DOES L275 CORRECT AT PIN 22 OF U900?
NO
PROCEED TO NPU5 ON PAGE 6
YES
DOES L500 CORRECT AT PIN 3 OF U900?
NO
PROCEED TO NPU4 ON PAGE 6
1

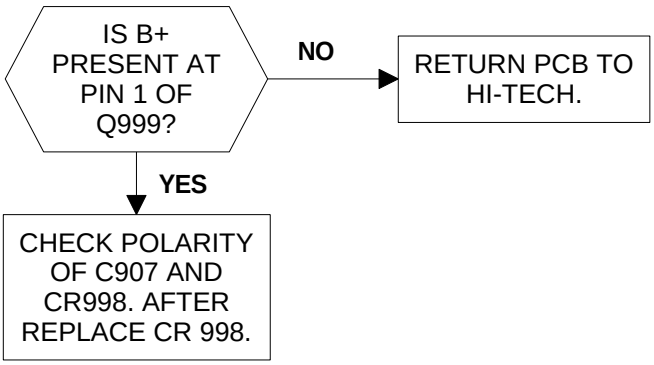
WILL NOT POWERS UP & STAY ON


1
DOES R275 CORRECT AT PIN 28 OF U900?
NO
PROCEED TO NPU6 ON PAGE 6
YES
DOES R475 CORRECT AT PIN 41 OF U900?
NO
PROCEED TO NPU7 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 37 OF U703?
NO
PROCEED TO NPU8 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 51 OF U701?
NO
PROCEED TO NPU9 ON PAGE 7
YES
DOES THE RESET LINE GO HIGH ON PIN 30 OF U900?
NO
PROCEED TO NPU10 ON PAGE 7
YES
REMOVE SHORT ON WATCHDOG PULL UP PADS
DOES THE WATCHDOG LINE GO HIGH ON PIN 31 OF U900?
NO
PROCEED TO NPU11 ON PAGE 7
YES
2

WILL NOT POWERS UP & STAY ON


2
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
IS THE CE PRESENT ON PIN 26 OF U702?
NO
PROCEED TO NPU12 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 39 AND 40 OF U704?
NO
PROCEED TO NPU13 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 27 OF U705?
NO
PROCEED TO NPU14 ON PAGE 7
YES
TRY TO RESOLDER FLASH-PROM U702 AND AFTER REPLACE IT.

NPU1:CHECK CONNECTOR J400 FOR DRY JOINT.



NPU2: CHECK SOLDER ON U900. ALSO CHECK T900 FOR SHORT CIRCUIT. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NPU3: CHECK CR910 C916 FOR POLARITY AFTER REPLACE T900.

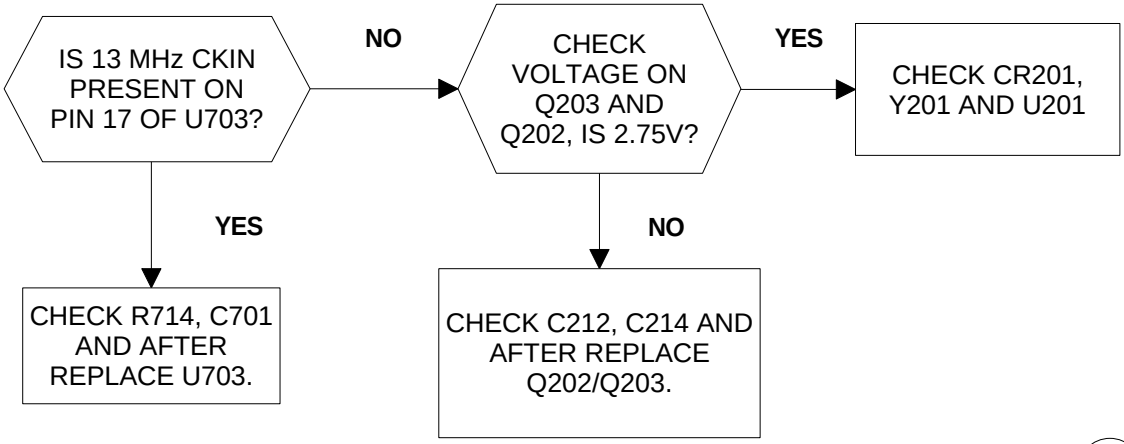
NPU4: CHECK POLARITY OF C901 AND AFTER REPLACE U900.

NPU5: CHECK C902 AND C903 FOR SHOR CIRCUIT AFTER REMOVE U900, IF THE S.C. STILL AGAIN SENT TO HI-TECH ; IF IS NOT ON S.C. REPLACE U900.

NPU6: CHECK C908 FOR SHORT CIRCUIT AND AFTER REPLACE U900.

NPU7: CHECK POLARITY OF C906 AND AFTER REPLACE U900.

NPU8:


IS 13 MHz CKIN PRESENT ON PIN 17 OF U703?
NO
CHECK VOLTAGE ON Q203 AND Q202, IS 2.75V?
YES
CHECK CR201, Y201 AND U201
YES
CHECK R714, C701 AND AFTER REPLACE U703.
NO
CHECK C212, C214 AND AFTER REPLACE Q202/Q203.

NPU9: CHECK TRACK FROM R714 TO PIN 51 OF U701.

NPU10: CHECK SOLDER ON U900, TRY TO RESOLDER U702 OR CONNECT RADIO TO THE EMMIBOX FOR UPGRADE.

NPU11: CHECK WATCHDOG LINE FROM PIN 31 OF U900 TO R741/PIN 56 OF U703, AND FROM PIN 31 OF U900 TO PIN 60 OF U701. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NPU12: U701 BEING SENT CE TO U704. CONTROL CE LINE FROM PIN 100 OF U701 TO PIN 26 OF U702, IF IS CORRECT REPLACE U702.

NPU13: U701 BEING SENT CE FROM PIN 102 TO PIN 40 OF U704. IF IS CORRECT REPLACE U704.

NPU14: U701 BEING SENT CE FROM PIN 114 TO PIN 27 OF U705 TRY TO CONNECT RADIO TO THE EMMIBOX FOR UPGRADE THE RADIO.

POWERS OFF WHEN TWISTED

CHECK Y201, CR201, U201, U702, U704 FOR POSITIONED CORRECTLY OR BAD SOLDER

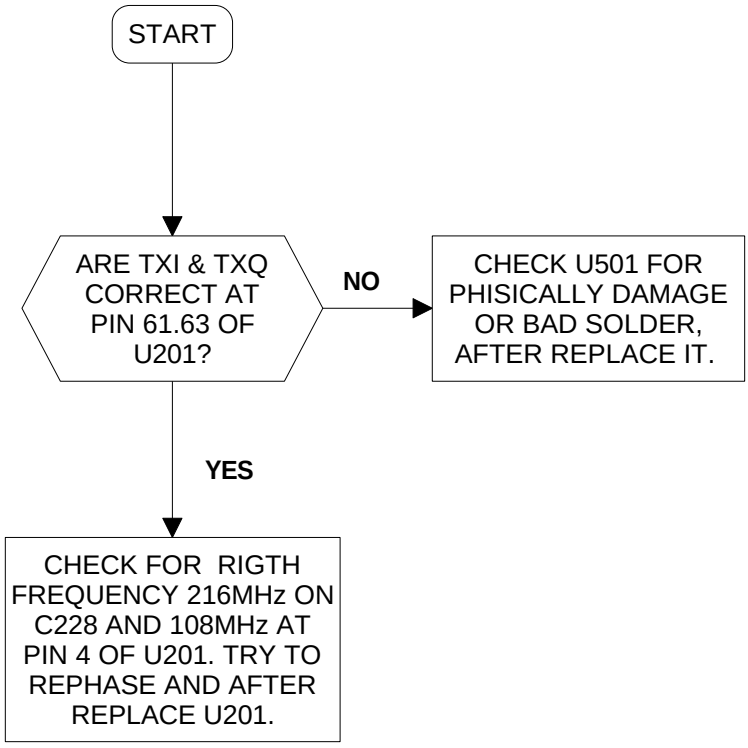
WILL NOT POWERS DOWN

CHECK IF THERE ISN'T ANY SHORT ON WATCHDOG PULL UP PADS. CHECK ALSO CONNECTION FROM PIN 25 OF J2 TO R990 OR BAD SOLDER ON U900. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

FREQUENCY ERROR OUT OF SPEC.

CHECK Y201 AND CR 201 FOR PHISICALLY DAMAGE OR BAD SOLDER.

PHASE ERROR OUT OF SPEC.

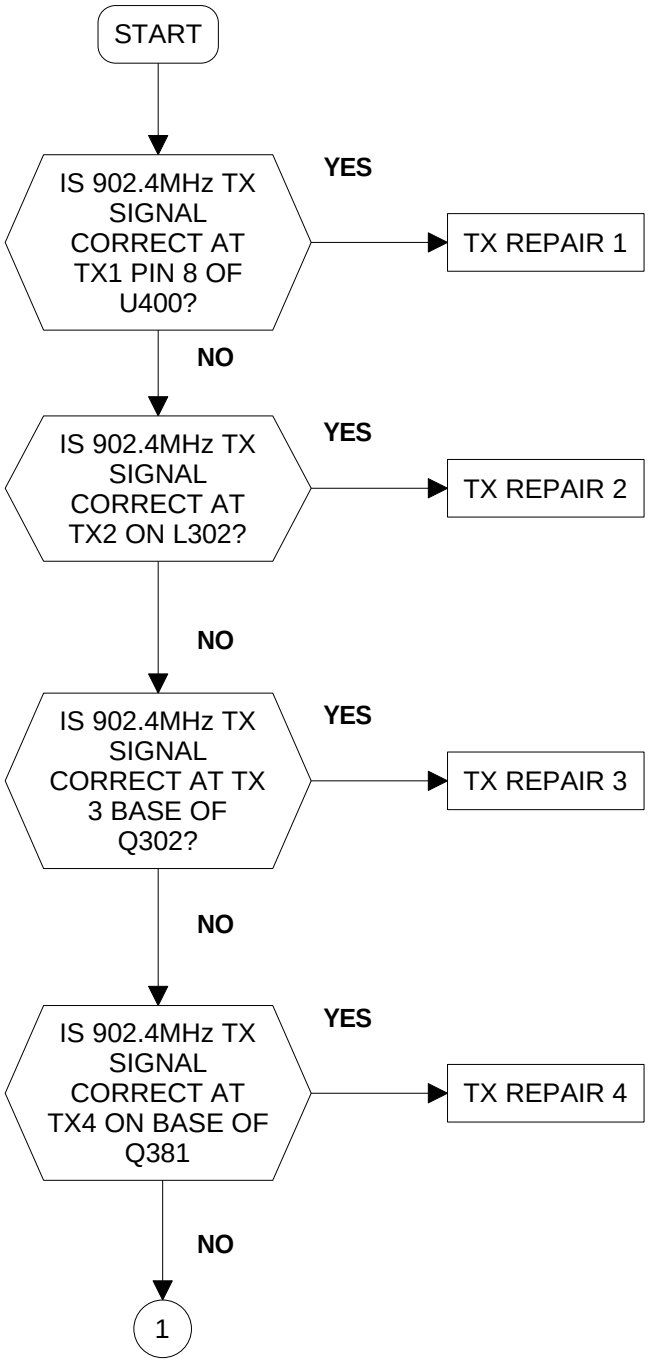

START
ARE TXI & TXQ CORRECT AT PIN 61.63 OF U201?
NO
CHECK U501 FOR PHISICALLY DAMAGE OR BAD SOLDER, AFTER REPLACE IT.
YES
CHECK FOR RIGTH FREQUENCY 216MHz ON C228 AND 108MHz AT PIN 4 OF U201. TRY TO REPHASE AND AFTER REPLACE U201.

WILL NOT INITIATE A CALL

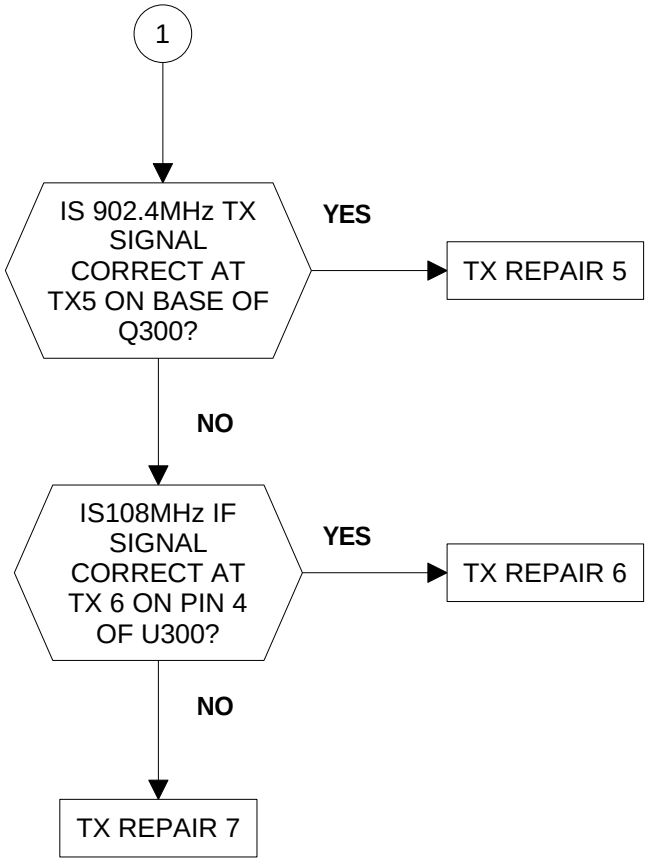
CONNECT 50 OHM LOAD TO THE ANTENNA PLUG, PUT THE RADIO IN TEST MODE AND SET TX POWER IN CONTINIOUS MODE OR IMPULSIVE MODE LIKE FOLLOWING INSTRUCTION:

CONTINUOS
11062# 1215# 40#

IMPULSIVE
11062# 1200#
310#



WILL NOT INITIATE A CALL



TX1: CHECKC442, L433 AND AFTER REPLACE U400

TX2: CHECK C439, L302.303.304, C328 AND C329 FOR PHISICALLY DAMAGE OR BAD SOLDER.

TX3: CHECK IF B+ IS PRESENT ON COLLECTOR OF Q302 AND PIN 2.3 OF Q301. IF B+ IS CORRECT TRACE THE TX SIGNAL TROUGH THE PATH FROM Q302 TO Q301 TO DECIPHER WICH IS THE FAILURE COMPONENT.

TX4: TAKES DC VOLTAGE MEASUREMENT AS FOLLOWING:

B+ C Q 381 **E 0.3V**

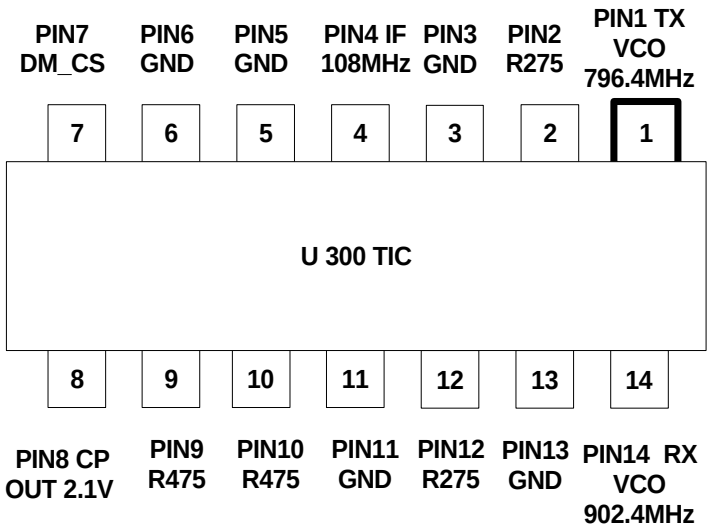
B 0.5V

IF THE COLLECTOR IS NOT SUPPLIED BY B+ CHANGE L380. IF B+ IS CORRECT REPLACE Q381.

TX5: TAKES DC MEASUREMENT VOLTAGE AS FOLLOWING: **WILL NOT INITIATE A CALL**

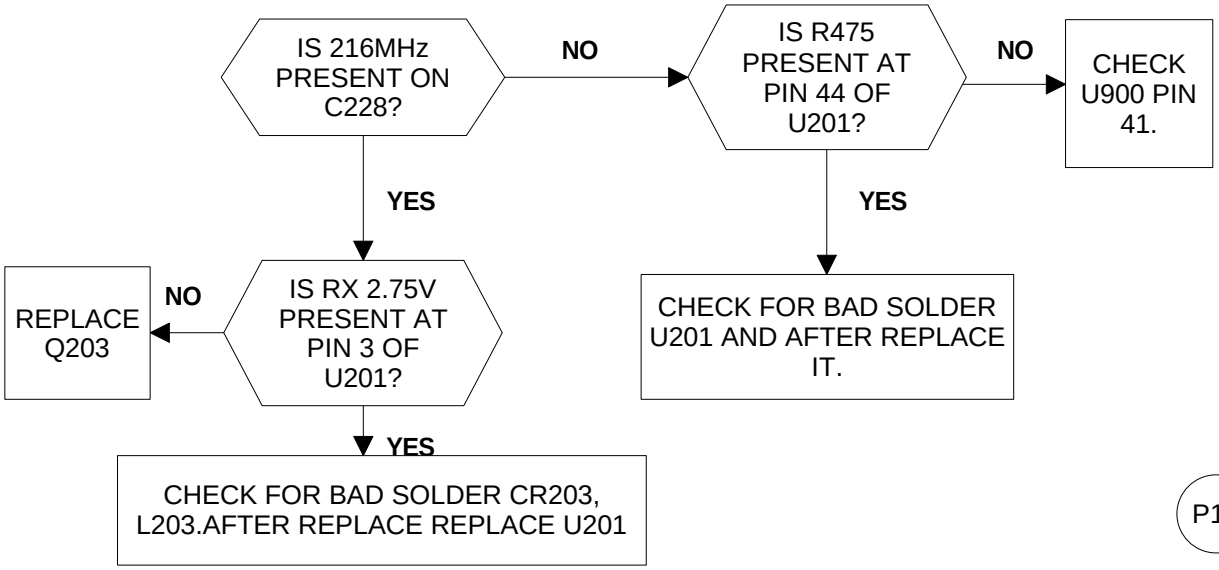
IF THE COLLECTOR IS NOT SUPLLIED BY 2.7V CHECK C 301.302.325. IF 2.7V ON COLLECTOR IS OK CHECK C 304.314.381 R352 AND AFTER REPLACE Q300.

TX6:



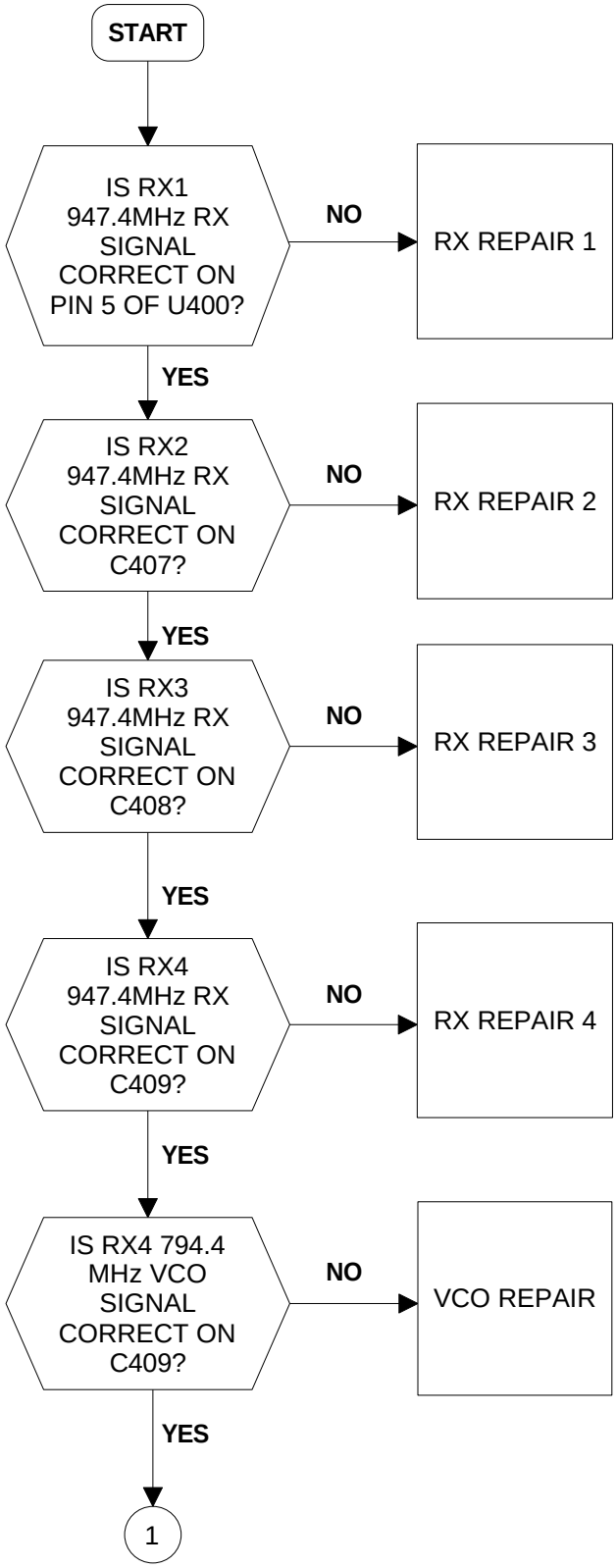
CHECK PRESENCE OF SIGAL FOLLOWING THE SCHEMATIC AS ABOVE TO DECIPHER WICH IS THE FAULTY LINE. IF EVERITHINGS ARE CORRECT REPLACE U300.

TX7:

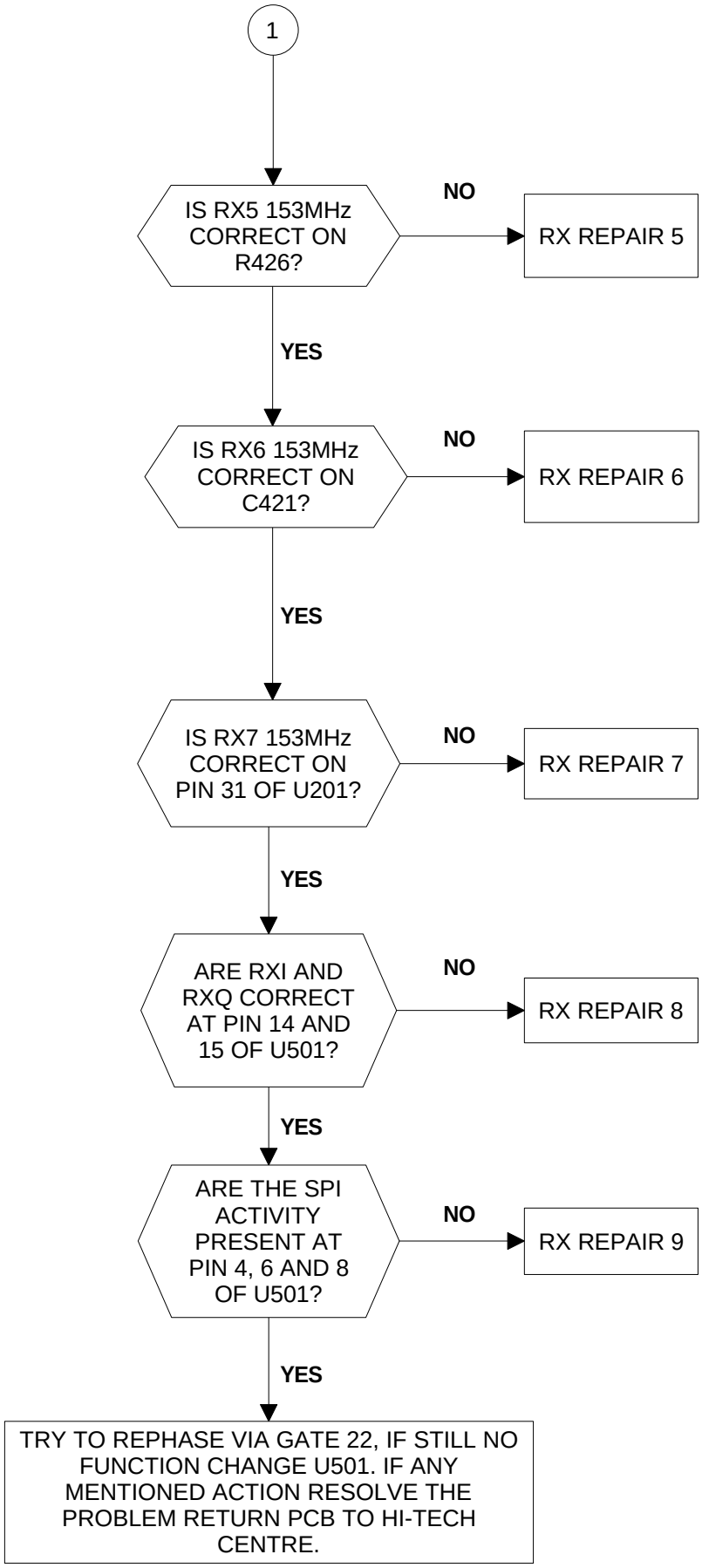

IS 216MHz PRESENT ON C228?
NO
IS R475 PRESENT AT PIN 44 OF U201?
NO
CHECK U900 PIN 41.
YES
YES
REPLACE Q203
NO
IS RX 2.75V PRESENT AT PIN 3 OF U201?
CHECK FOR BAD SOLDER U201 AND AFTER REPLACE IT.
YES
CHECK FOR BAD SOLDER CR203, L203.AFTER REPLACE REPLACE U201

NO SERVICE AT -102dBm

SET THE COMMUNICATIONANALYZER TO INJECT VIA ANTENNA PLUG -30dBm AT 947.4MHz, PUT THE RADIO IN TEST MODE AND LOAD SYNTHETIZER WITH 33062# COMMAND.



NO SERVICE AT -102dBm


1
IS RX5 153MHz CORRECT ON R426?
NO
RX REPAIR 5
YES
IS RX6 153MHz CORRECT ON C421?
NO
RX REPAIR 6
YES
IS RX7 153MHz CORRECT ON PIN 31 OF U201?
NO
RX REPAIR 7
YES
ARE RXI AND RXQ CORRECT AT PIN 14 AND 15 OF U501?
NO
RX REPAIR 8
YES
ARE THE SPI ACTIVITY PRESENT AT PIN 4, 6 AND 8 OF U501?
NO
RX REPAIR 9
YES
TRY TO REPHASE VIA GATE 22, IF STILL NO FUNCTION CHANGE U501. IF ANY MENTIONED ACTION RESOLVE THE PROBLEM RETURN PCB TO HI-TECH CENTRE.

NO SERVICE AT -102dBm

RX1: FROM ANTENNA PORT CHECK L439, C440 FOR BAD SOLDER AND AFTER REPLACE U400. FROM SWITCH RF CHECK L443, C442 FOR BAD SOLDER AND AFTER REPLACE U400.

RX2:CHECK IF FL451 IS POSITIONED CORRECTLY OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL451.

RX3:TAKES ON Q418 DC MEASUREMENT LIKE AS FOLLOWING:

1.3V B
Q 418 **C 2.7V**
0.5V E

IF THE COLLECTOR IS NOT SUPLLY BY RX275, CHECK Q203 AND ASSOCIATE CIRCUITRY.AFTER REPLACE Q203.

IF THE COLLECTOR IS SUPLLY BY RX275 FROM Q203 CHECK L412, R432 AND AFTER REPLACE Q418.

RX4:CHECK FL452 FOR PHICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL452.

RX5: TAKES ON Q420 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

1V B
Q 420 **C 2.7V**
0.37 E

IF THE COLLECTOR IS NOT SUPPLY BY RX275, CHECK L414 AND AFTER REPLACE Q203.

IF THE COLLECTOR SUPLLY IS CORRECT REPLACE Q420.

RX6:CHECK FL420 IF IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL420.

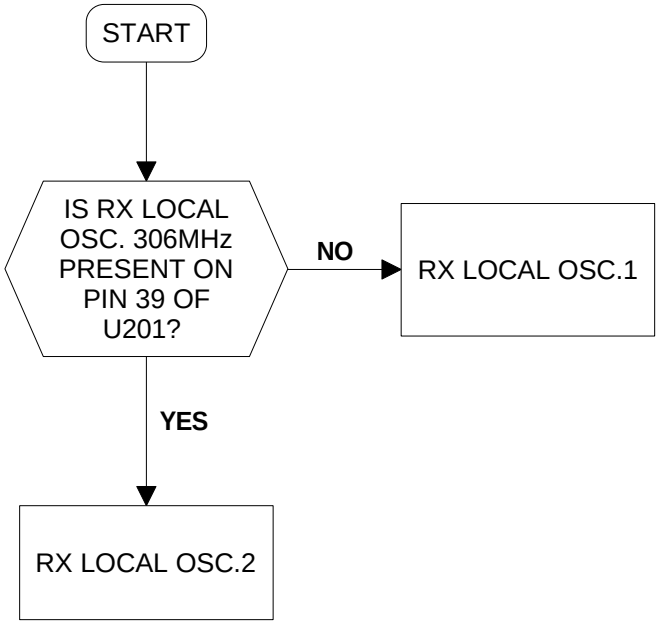
RX7:TAKES ON Q421 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

0V B
Q 421 **C 1.9V**
0.6V E

IF THE COLLECTOR SUPPLY IS CORRECT REPLACE Q421.

IF THE COLLECTOR IS NOT SUPPLY BY PIN 33 OF U201, CHECK R423 AND AFTER REPLACE U201.

RX:8



RX9:IF THERE IS NOT ACTIVITY ON SPI BUS TRY TO REPHASE AND AFTER REPLACE U501.

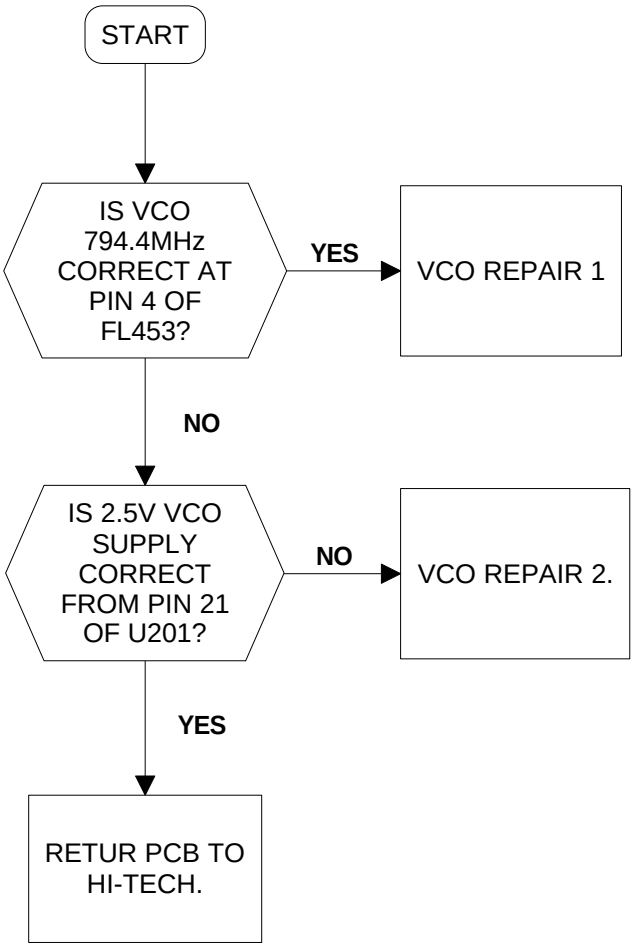
RX LOCAL OSC.1:CHECK FOR CR431, L433 AND U201 PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U201.

RX LOCAL OSC.2:CHECK IQ_ REF FROM PIN 16 OF U501 TO PIN47 OF U201, 1.38V IS CORRECT CONTROL FROM MODEM.

IF THE CONTROL IS CORRECT CHANGE U201.

IF THE CONTROL IS NOT CORRECT, TRY TO REPHASE AND AFTER REPLACE U501.

VCO REPAIR:

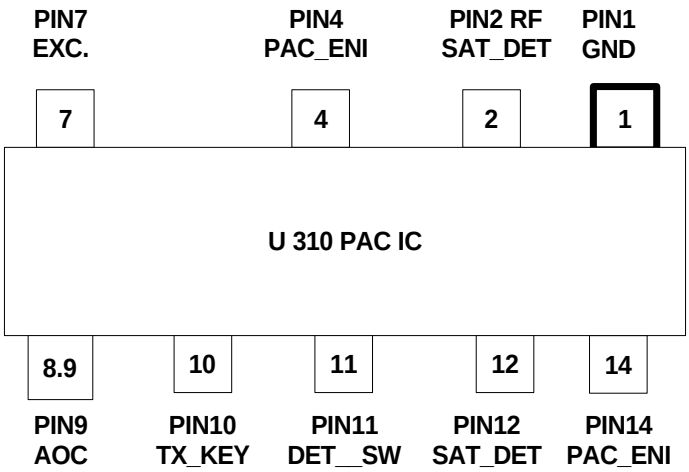


VCO REPAIR 1:CHECK IF FL453 IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL453.

VCO REPAIR 2:CHECK SUPPLIES FROM Q203 AND Q202. IF THEY ARE INCORRECT TAKES REFERENCE FROM A FULLY FUNCTIONALLY PCB TO DECIPHER WHICH COMPONENTS CAUSES NO OR POOR SUPER FILTER SUPPLY FOR VCO.POSSIBLE DEFECTIVE COMPONENTS ARE Q202, Q203,C212,C214 AND U201.

POWER BURST OUT OF SPEC.

FOLLOWING THE SCHEMATIC OF PAC_IC U310 CHECK THE PIN 7 (PA CONTROL) IF IS CORRECT REPLACE Q301, Q302. IF IS NOT CORRECT CHECK THE OTHER PIN TO TRACE THE FAULTY LINE.

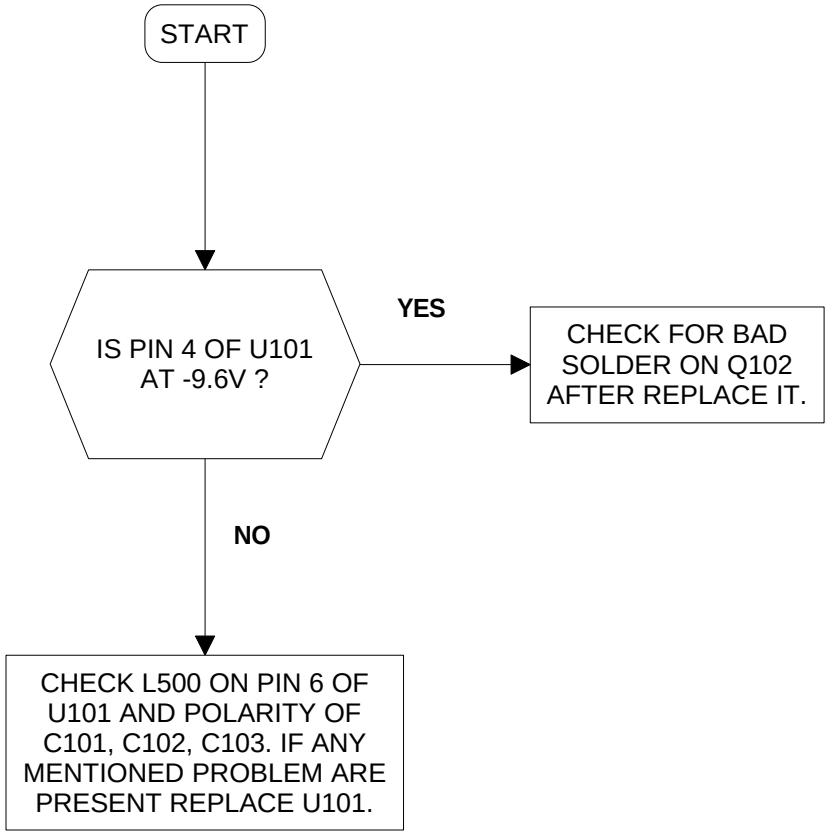


IF ANY MENTIONED PROBLEMS ARE PRESENT RETURN PCB TO HI-TECH.

INCORRECT LOW BATTERY INDICATION

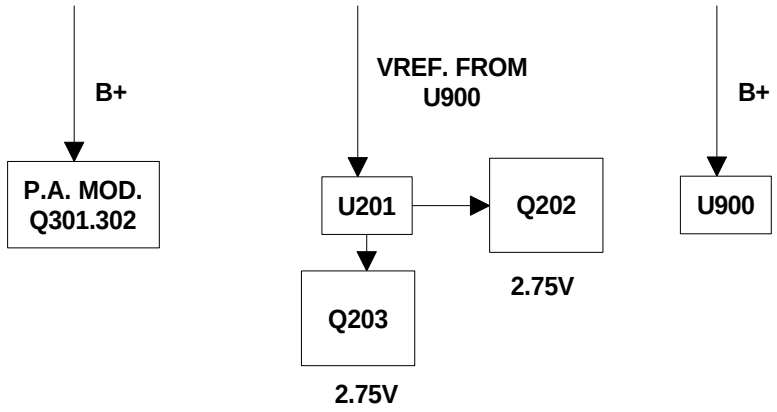
CHECK PIN 46 AND 47 OF U901 FOR CORRECT INDICATION TO U703 PIN 4 AND 64.TRY TO REPHASE (MASTER CARD AND AFTER GATE 22) AND IF ANYTHING CHANGE REPLACE U703.

NO OR LOW DISPLAY

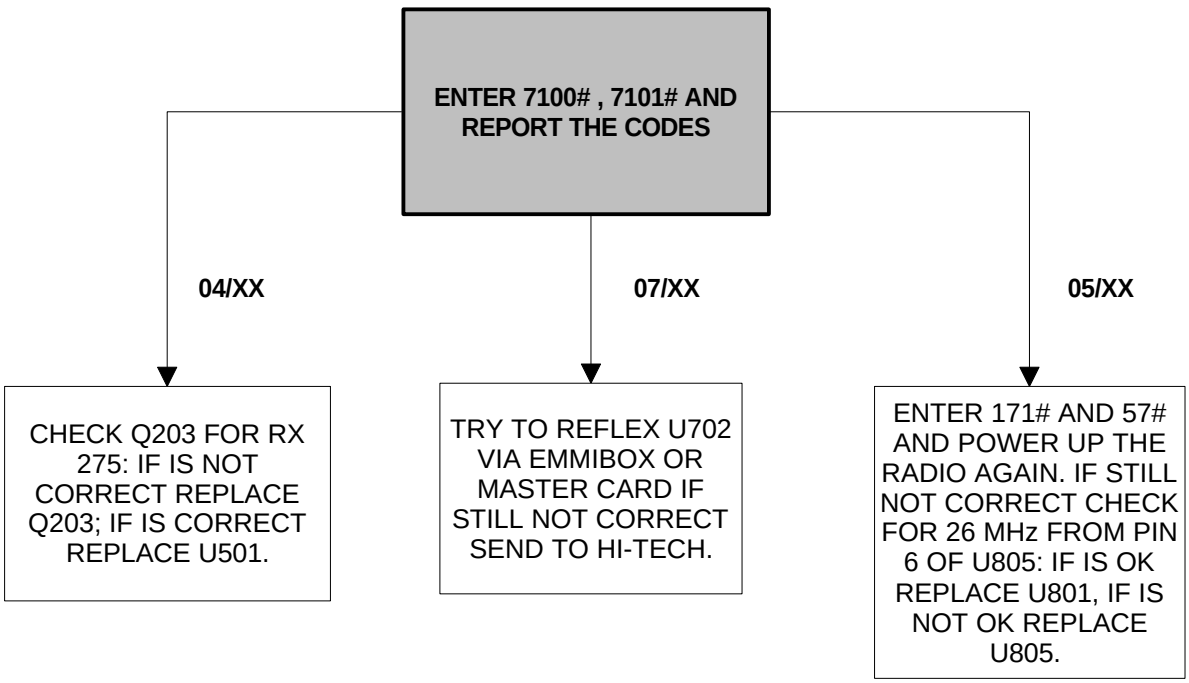

START
IS PIN 4 OF U101 AT -9.6V ?
YES
CHECK FOR BAD SOLDER ON Q102 AFTER REPLACE IT.
NO
CHECK L500 ON PIN 6 OF U101 AND POLARITY OF C101, C102, C103. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U101.

PCB DRAWS CURRENT WHEN IS OFF

CHECK TRANSISTOR REGULATOR: Q202, Q203 AND U201 ARE NOT PHISCALLY DAMAGE; CHECK ALSO U900 TO MONITORING WHICH COMPONENT BECOMING WARMER AFTER REPLACE IT.

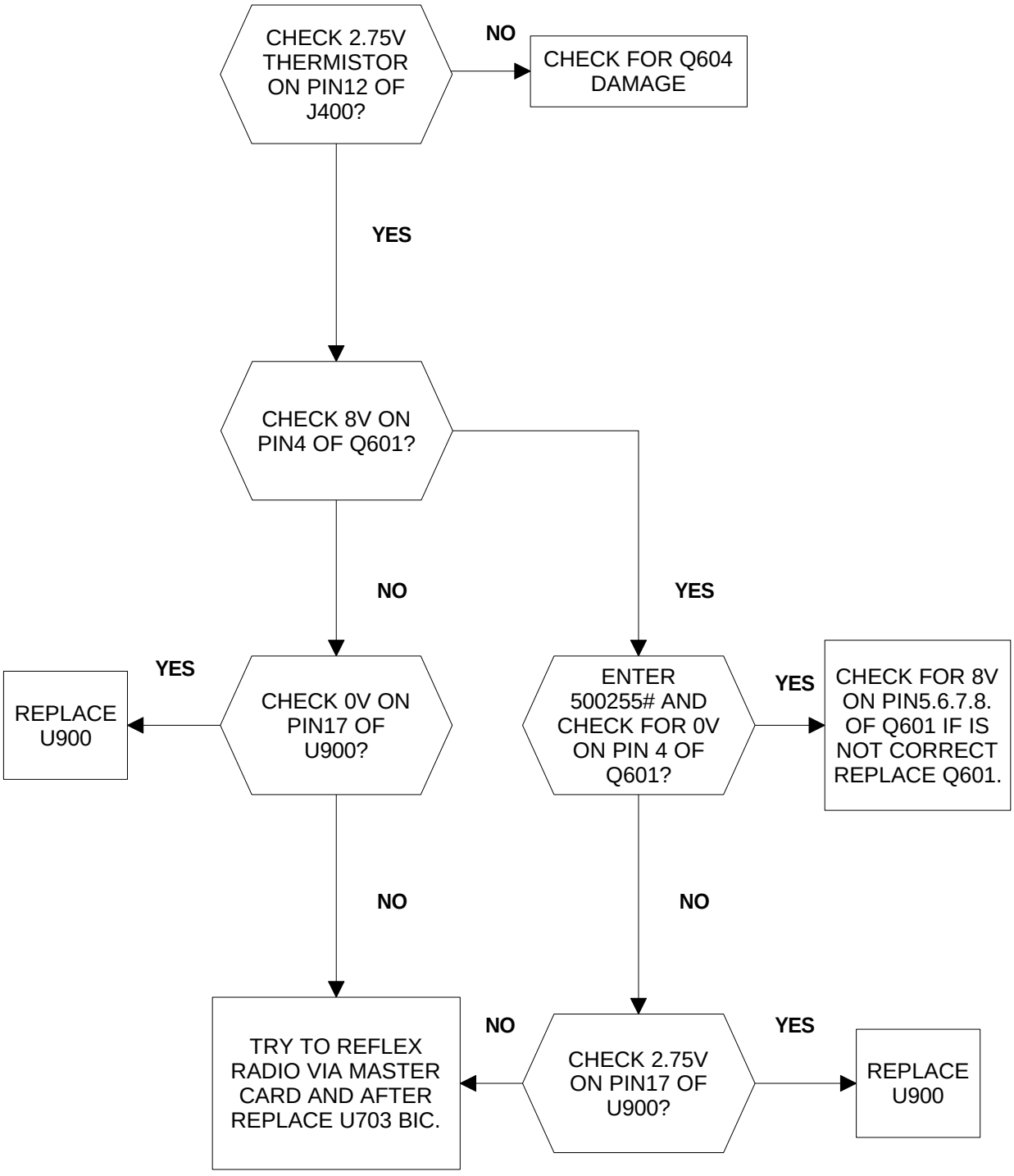


PHONE FAILED SEE SUPPLIER

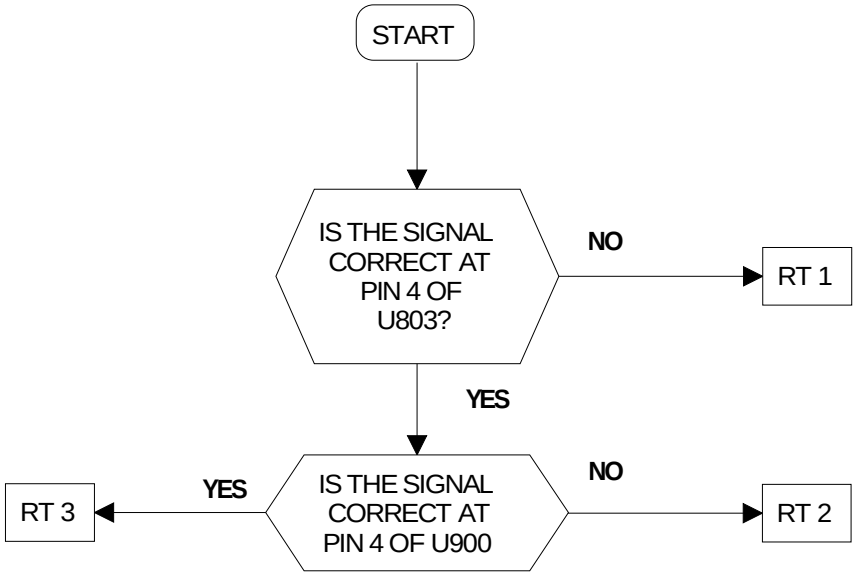

ENTER 7100# , 7101# AND REPORT THE CODES
04/XX
07/XX
05/XX
CHECK Q203 FOR RX 275: IF IS NOT CORRECT REPLACE Q203; IF IS CORRECT REPLACE U501.
TRY TO REFLEX U702 VIA EMMIBOX OR MASTER CARD IF STILL NOT CORRECT SEND TO HI-TECH.
ENTER 171# AND 57# AND POWER UP THE RADIO AGAIN. IF STILL NOT CORRECT CHECK FOR 26 MHz FROM PIN 6 OF U805: IF IS OK REPLACE U801, IF IS NOT OK REPLACE U805.

NO CHARGER

TEST CONDICTION: RADIO SUPPLY FROM EXT B+ AND IN TEST-MODE


CHECK 2.75V THERMISTOR ON PIN12 OF J400?
NO
CHECK FOR Q604 DAMAGE
YES
CHECK 8V ON PIN4 OF Q601?
NO
YES
CHECK 0V ON PIN17 OF U900?
YES
REPLACE U900
ENTER 500255# AND CHECK FOR 0V ON PIN 4 OF Q601?
YES
CHECK FOR 8V ON PIN5.6.7.8. OF Q601 IF IS NOT CORRECT REPLACE Q601.
NO
NO
TRY TO REFLEX RADIO VIA MASTER CARD AND AFTER REPLACE U703 BIC.
NO
CHECK 2.75V ON PIN17 OF U900?
YES
REPLACE U900

NO OR LOW RING TONE

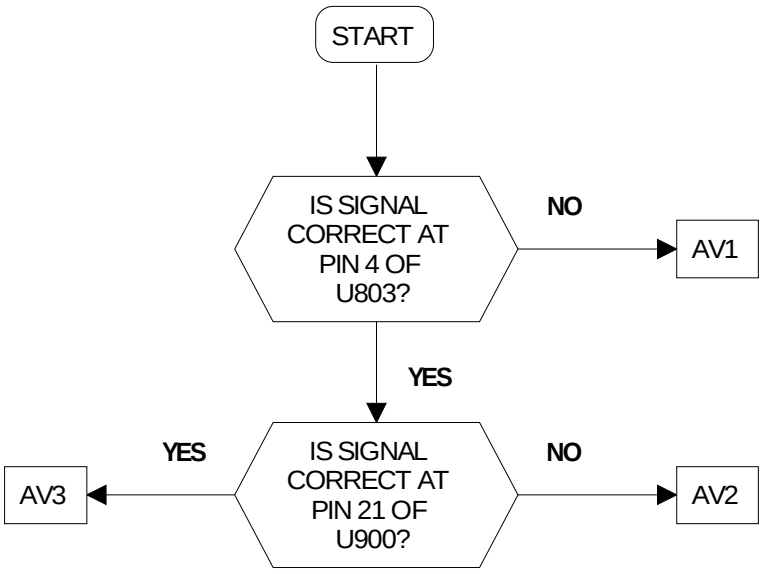


RT1: CHECK IF U801 IS POSITIONED CORRECTLY OR BAD SOLDER, IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U801

RT2: CHECK IF U802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER ALSO CHECK C825,C817 AND R803. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803

RT3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 4.5.6.7, CHECK ALSO PIN CONNECTOR 5.7 OF J2. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO VOLUME

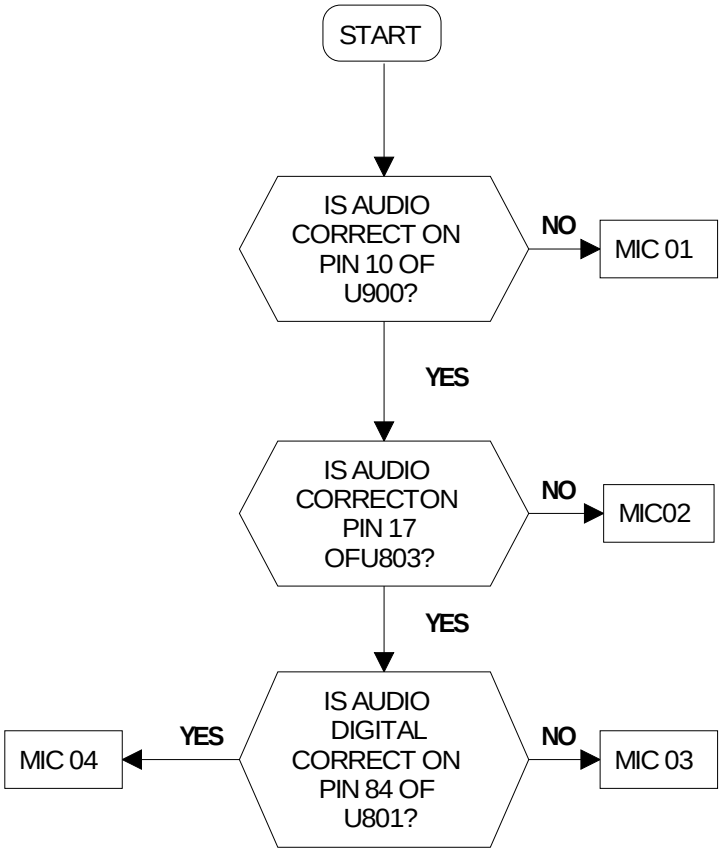


AV1: CHECK IF U801 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV2: CHECK IFU802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER, ALSO CHECK C825 AND R810. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 19.20.21, PIN CONNECTOR 22.20 OF J2 AND R802,R810,C804 AND C825. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO MICROPHONE

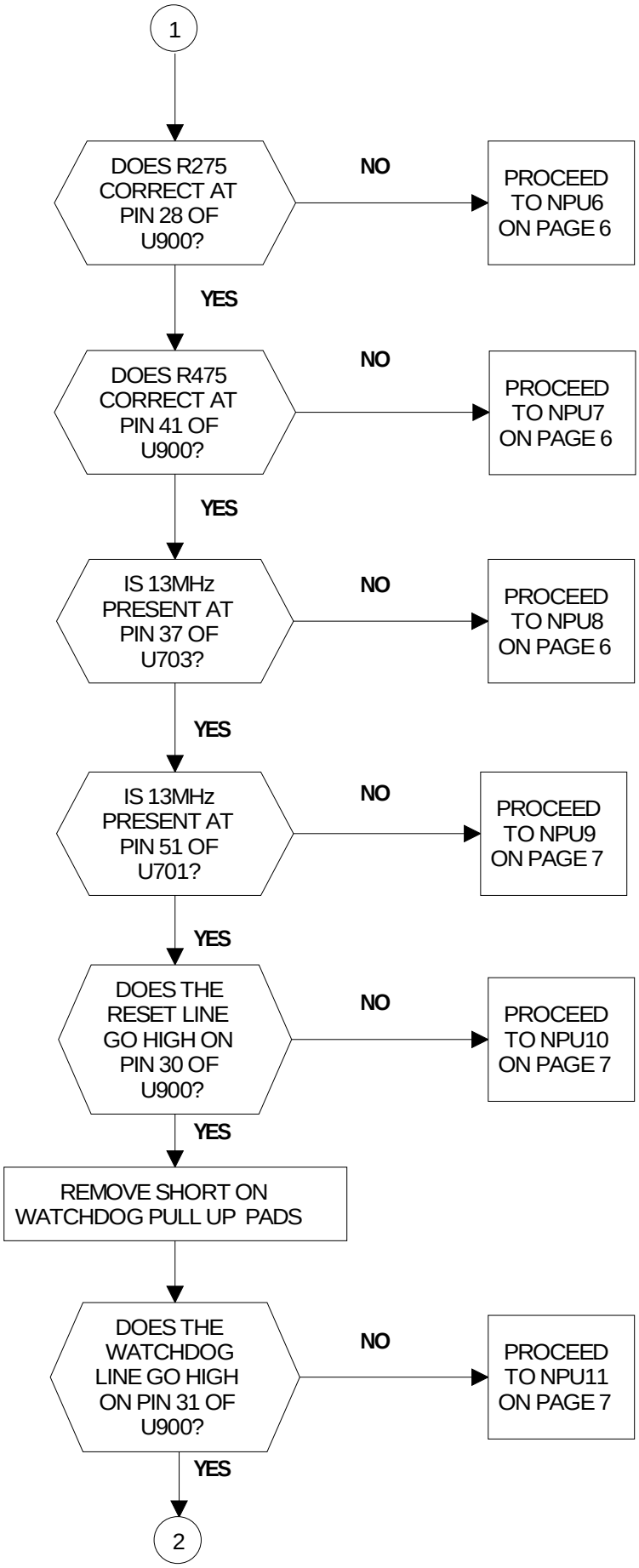


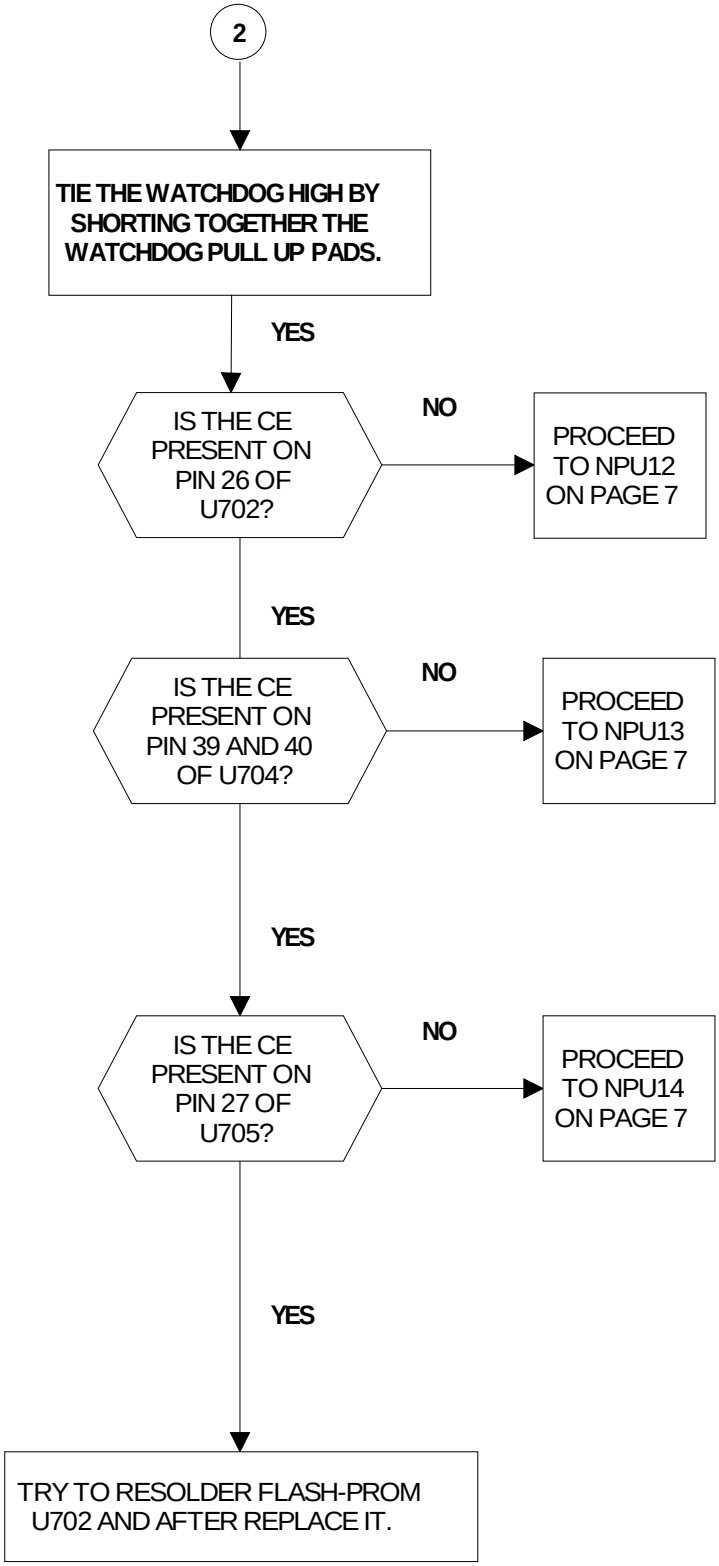
MIC 01: CHECK J802, C810, C813, C808, R806, R805 FOR BAD SOLDER.

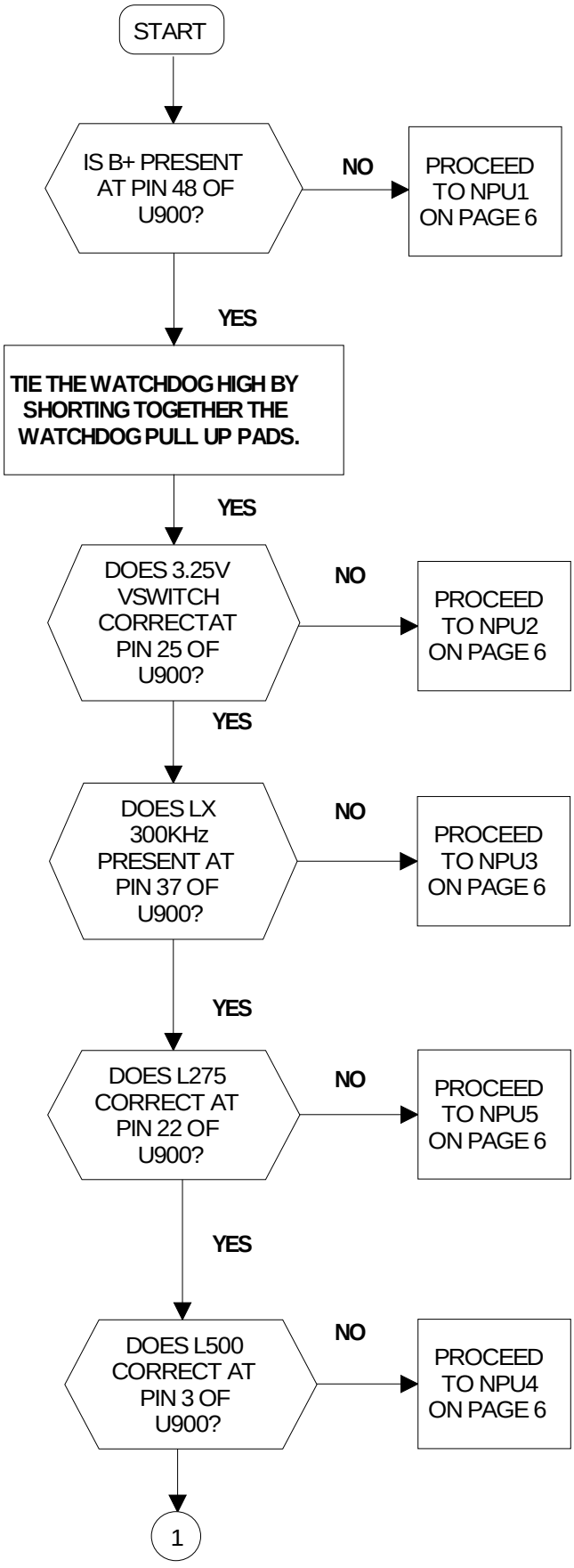
MIC02: CHECK VOLTAGE ON PIN 17/18/19/20 OF U803, IS ABOUT 2.4V, IF IS NOT CORRECT REPLACE C832 AND C848; IF IS CORRECT CHECK U900 AND AFTER REPLACE IT.

MIC 03: CHECK IF U803 AND R838, R842, R841 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U803.

MIC 04: CHECK IF U801 AND R845 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U801.


1
DOES R275 CORRECT AT PIN 28 OF U900?
NO
PROCEED TO NPU6 ON PAGE 6
YES
DOES R475 CORRECT AT PIN 41 OF U900?
NO
PROCEED TO NPU7 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 37 OF U703?
NO
PROCEED TO NPU8 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 51 OF U701?
NO
PROCEED TO NPU9 ON PAGE 7
YES
DOES THE RESET LINE GO HIGH ON PIN 30 OF U900?
NO
PROCEED TO NPU10 ON PAGE 7
YES
REMOVE SHORT ON WATCHDOG PULL UP PADS
DOES THE WATCHDOG LINE GO HIGH ON PIN 31 OF U900?
NO
PROCEED TO NPU11 ON PAGE 7
YES
2


2
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
IS THE CE PRESENT ON PIN 26 OF U702?
NO
PROCEED TO NPU12 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 39 AND 40 OF U704?
NO
PROCEED TO NPU13 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 27 OF U705?
NO
PROCEED TO NPU14 ON PAGE 7
YES
TRY TO RESOLDER FLASH-PROM U702 AND AFTER REPLACE IT.


START
IS B+ PRESENT AT PIN 48 OF U900?
NO
PROCEED TO NPU1 ON PAGE 6
YES
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
DOES 3.25V VSWITCH CORRECTAT PIN 25 OF U900?
NO
PROCEED TO NPU2 ON PAGE 6
YES
DOES LX 300KHz PRESENT AT PIN 37 OF U900?
NO
PROCEED TO NPU3 ON PAGE 6
YES
DOES L275 CORRECT AT PIN 22 OF U900?
NO
PROCEED TO NPU5 ON PAGE 6
YES
DOES L500 CORRECT AT PIN 3 OF U900?
NO
PROCEED TO NPU4 ON PAGE 6
1

POWERS OFF WHEN TWISTED

CHECK Y201, CR201, U201, U702, U704 FOR POSITIONED CORRECTLY OR BAD SOLDER

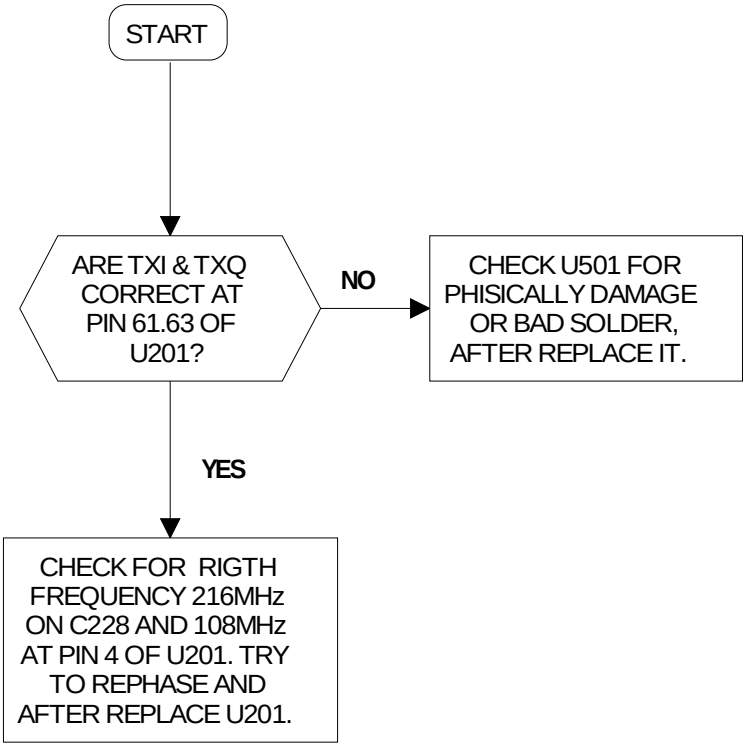
WILL NOT POWERS DOWN

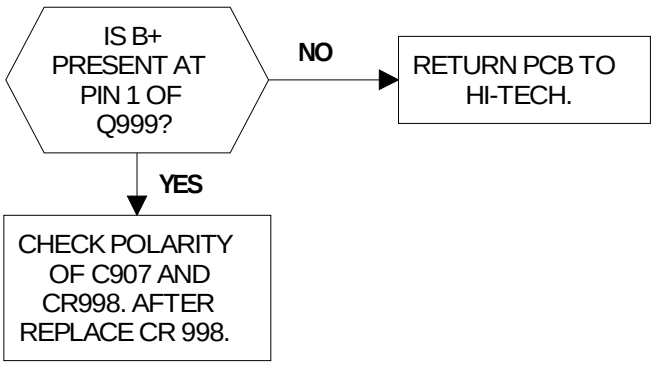
CHECK IF THERE ISN'T ANY SHORT ON WATCHDOG PULL UP PADS. CHECK ALSO CONNECTION FROM PIN 25 OF J2 TO R990 OR BAD SOLDER ON U900. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

FREQUENCY ERROR OUT OF SPEC.

CHECK Y201 AND CR 201 FOR PHISICALLY DAMAGE OR BAD SOLDER.

PHASE ERROR OUT OF SPEC.


START
ARE TXI & TXQ CORRECT AT PIN 61.63 OF U201?
NO
CHECK U501 FOR PHISICALLY DAMAGE OR BAD SOLDER, AFTER REPLACE IT.
YES
CHECK FOR RIGTH FREQUENCY 216MHz ON C228 AND 108MHz AT PIN 4 OF U201. TRY TO REPHASE AND AFTER REPLACE U201.



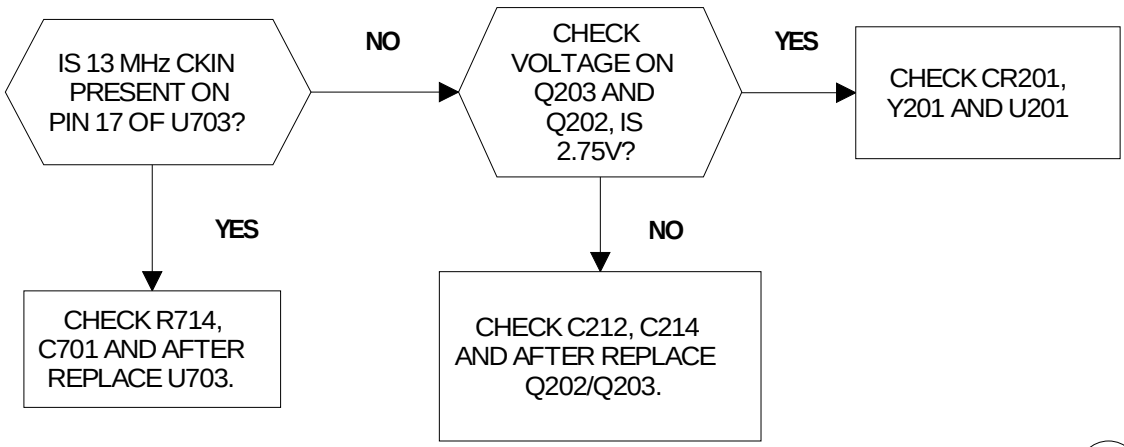
NPU3: CHECK CR910 C916 FOR POLARITY AFTER REPLACE T900.

NPU4: CHECK POLARITY OF C901 AND AFTER REPLACE U900.

NPU6: CHECK C908 FOR SHORT CIRCUIT AND AFTER REPLACE U900.

NPU7: CHECK POLARITY OF C906 AND AFTER REPLACE U900.

NPU8:


IS 13 MHz CKIN PRESENT ON PIN 17 OF U703?
NO
CHECK VOLTAGE ON Q203 AND Q202, IS 2.75V?
YES
CHECK CR201, Y201 AND U201
YES
NO
CHECK R714, C701 AND AFTER REPLACE U703.
CHECK C212, C214 AND AFTER REPLACE Q202/Q203.

NPU9: CHECK TRACK FROM R714 TO PIN 51 OF U701.

NPU10: CHECK SOLDER ON U900, TRY TO RESOLDER U702
OR CONNECT RADIO TO THE EMMIBOX FOR UPGRADE.

NPU11: CHECK WATCHDOG LINE FROM PIN 31 OF U900 TO R741/PIN 56 OF U703, AND FROM PIN 31 OF U900 TO PIN 60 OF U701. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NPU12: U701 BEING SENT CE TO U704. CONTROL CE LINE FROM PIN 100 OF U701 TO PIN 26 OF U702, IF IS CORRECT REPLACE U702.

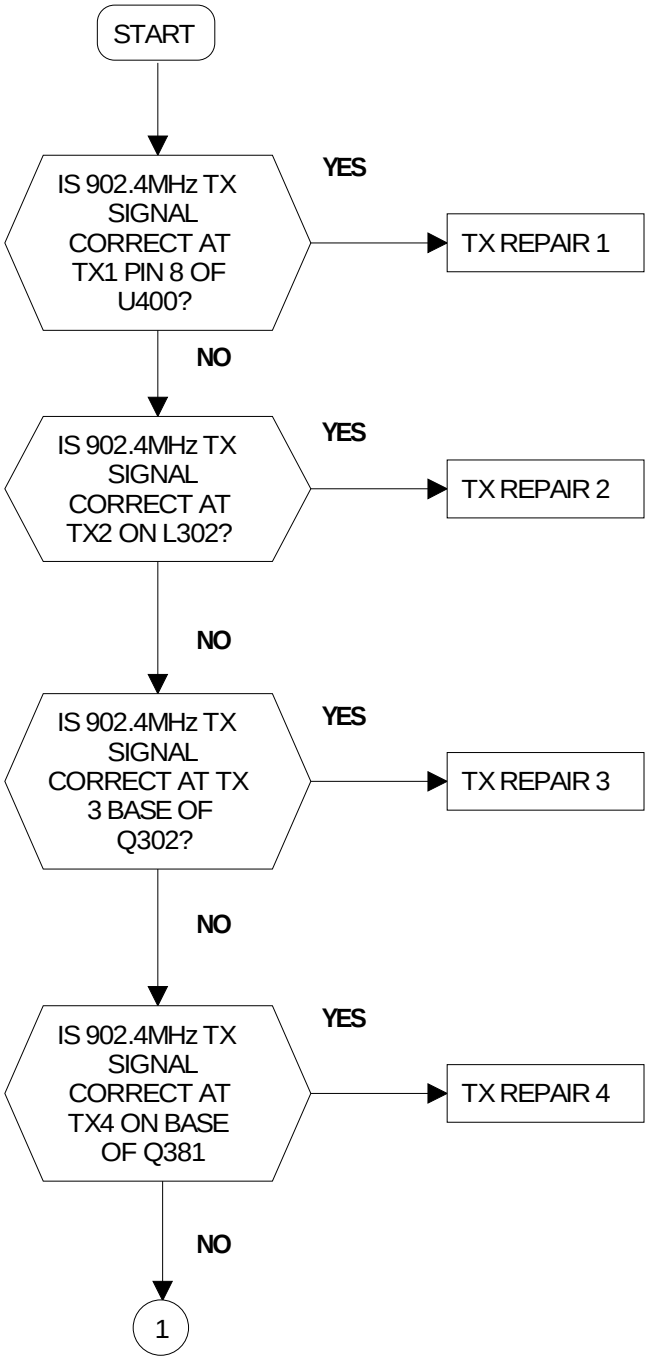
NPU13: U701 BEING SENT CE FROM PIN 102 TO PIN 40 OF U704. IF IS CORRECT REPLACE U704.

NPU14: U701 BEING SENT CE FROM PIN 114 TO PIN 27 OF U705 TRY
TO CONNECT RADIO TO THE EMMIBOX FOR UPGRADE THE RADIO.

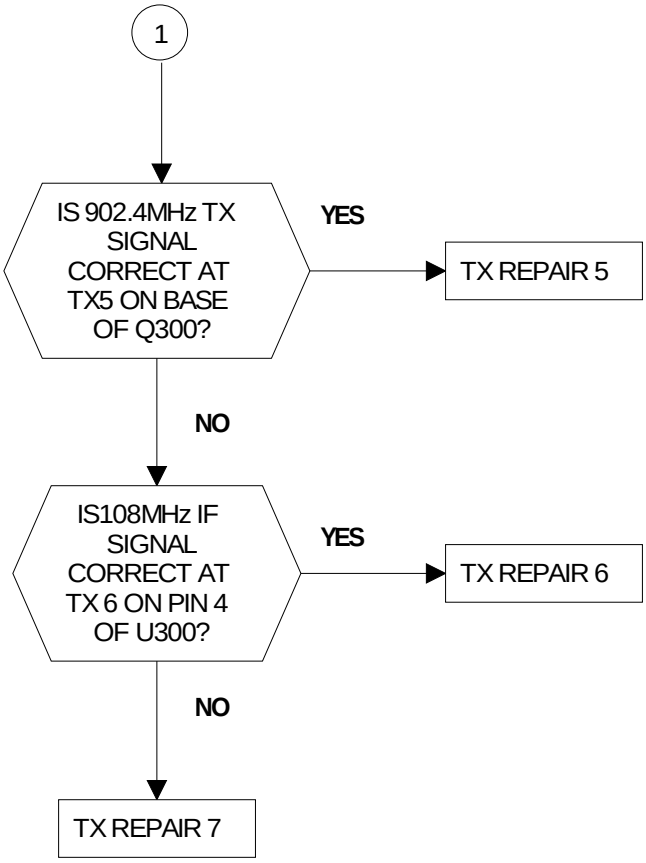
WILL NOT INITIATE A CALL

CONTINUOS
11062# 1215# 40#

IMPULSIVE
11062# 1200#
310#



WILL NOT INITIATE A CALL



TX1: CHECKC442, L433 AND AFTER REPLACE U400

TX2: CHECK C439, L302.303.304, C328 AND C329 FOR PHISICALLY DAMAGE OR BAD SOLDER.

TX3: CHECK IF B+ IS PRESENT ON COLLECTOR OF Q302 AND PIN 2.3 OF Q301. IF B+ IS CORRECT TRACE THE TX SIGNAL TROUGH THE PATH FROM Q302 TO Q301 TO DECIPHER WICH IS THE FAILURE COMPONENT.

TX4: TAKES DC VOLTAGE MEASUREMENT AS FOLLOWING:

E 0.3V

B+ C Q 381

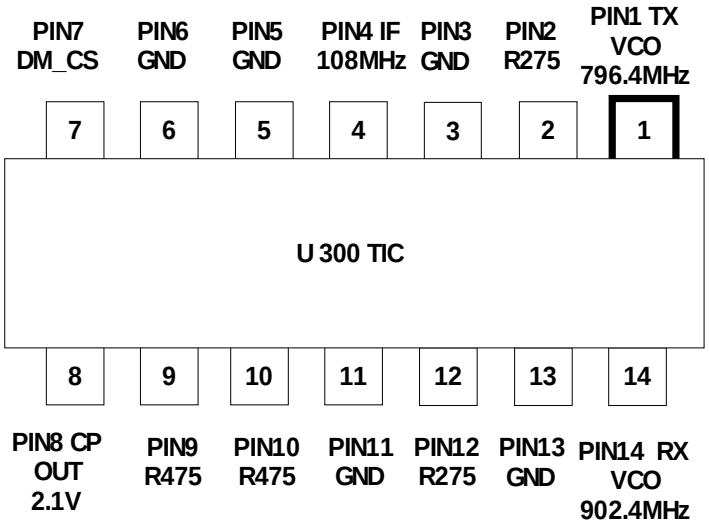
B 0.5V

IF THE COLLECTOR IS NOT SUPPLIED BY B+ CHANGE L380. IF B+ IS CORRECT REPLACE Q381.

WILL NOT INITIATE A CALL

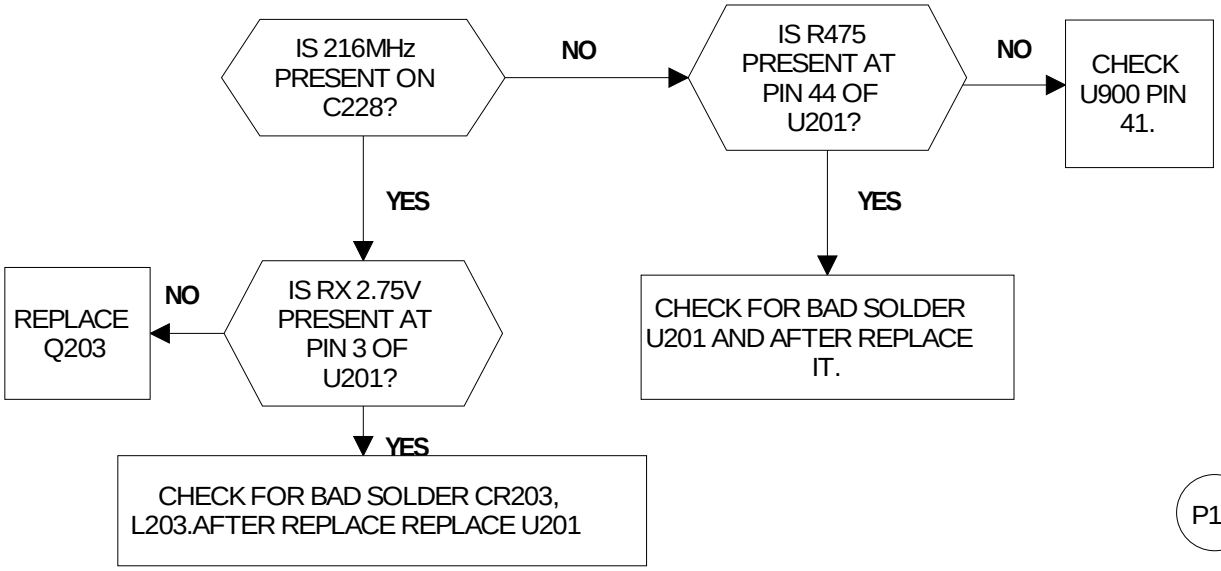
IF THE COLLECTOR IS NOT SUPLLIED BY 2.7V CHECK C 301.302.325. IF 2.7V ON COLLECTOR IS OK CHECK C 304.314.381 R352 AND AFTER REPLACE Q300.

TX6:



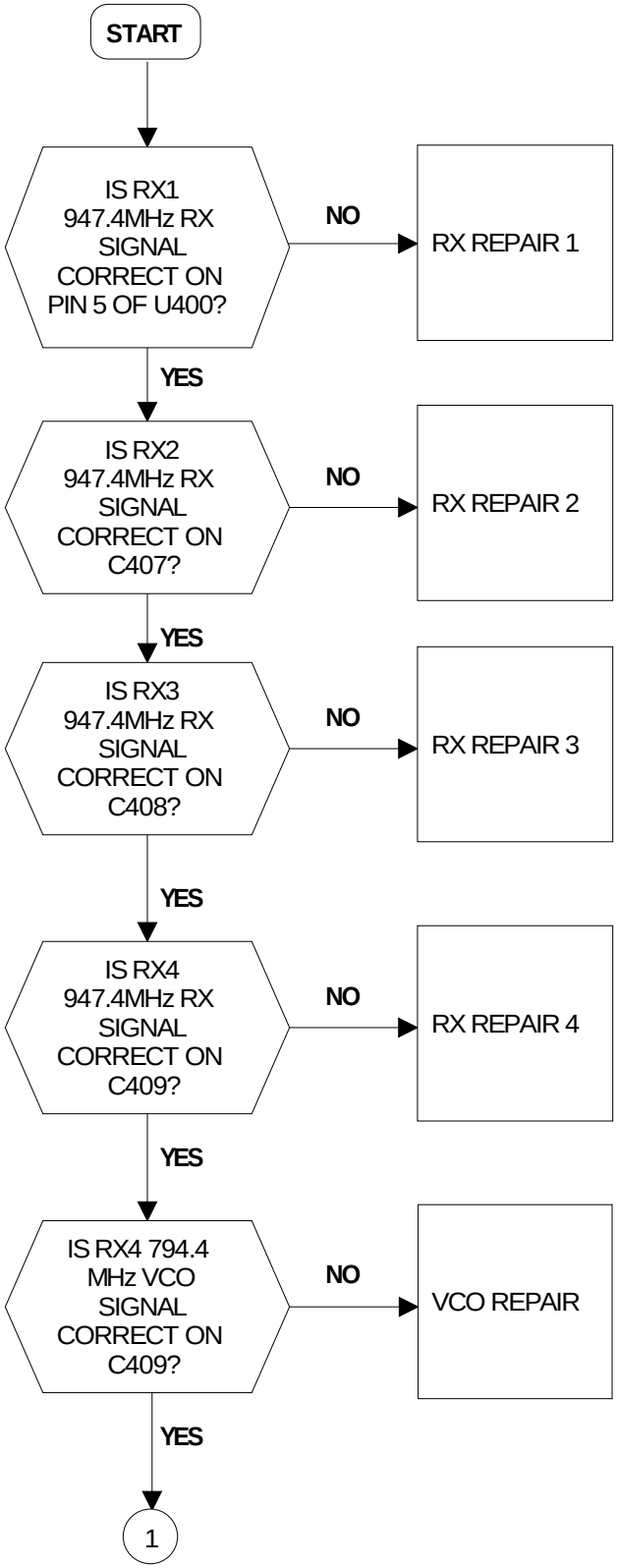
CHECK PRESENCE OF SIGAL FOLLOWING THE SCHEMATIC AS ABOVE TO DECIPHER WICH IS THE FAULTY LINE. IF EVERITHINGS ARE CORRECT REPLACE U300.

TX7:

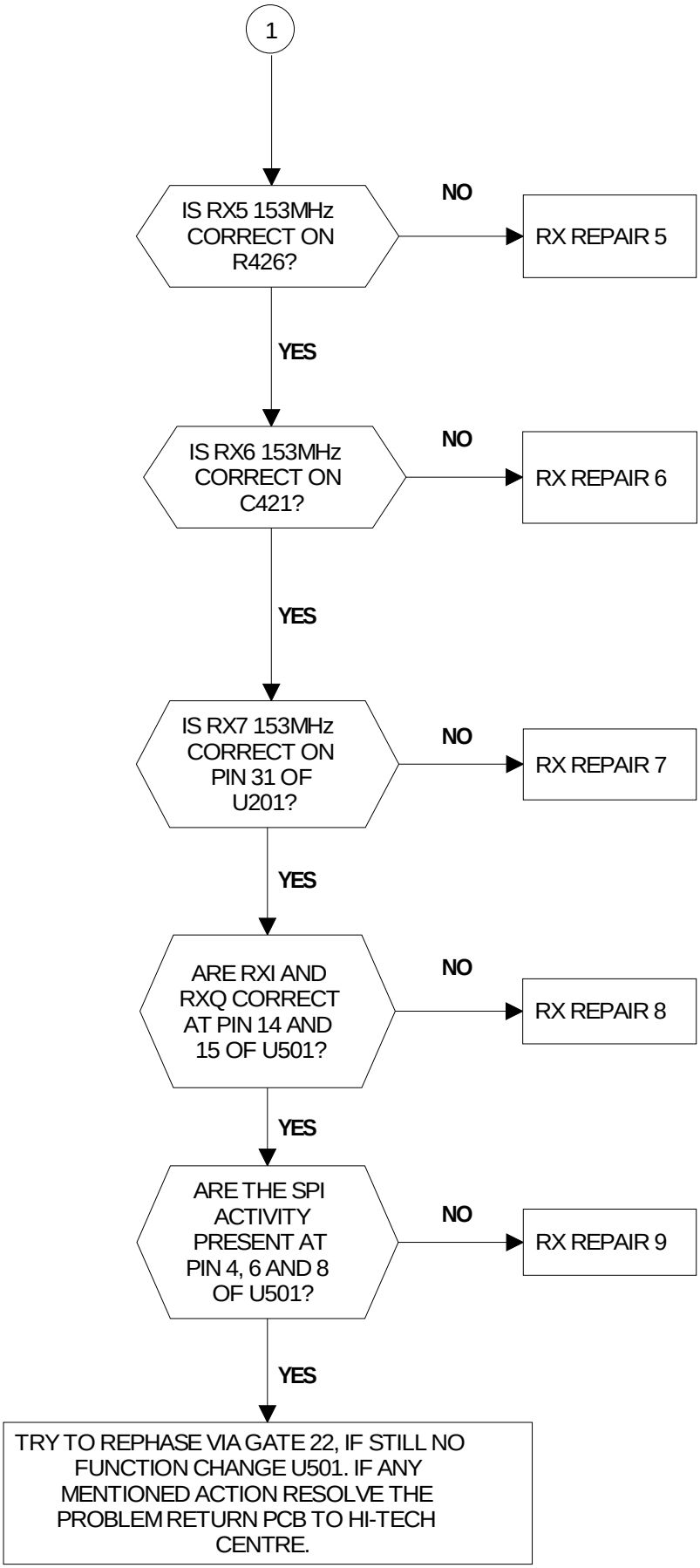

IS 216MHz PRESENT ON C228?
NO
IS R475 PRESENT AT PIN 44 OF U201?
NO
CHECK U900 PIN 41.
YES
YES
REPLACE Q203
NO
IS RX 2.75V PRESENT AT PIN 3 OF U201?
CHECK FOR BAD SOLDER U201 AND AFTER REPLACE IT.
YES
CHECK FOR BAD SOLDER CR203, L203.AFTER REPLACE REPLACE U201

NO SERVICE AT -102dBm

SET THE COMMUNICATIONANALYZER TO INJECT VIA ANTENNA PLUG -30dBm AT 947.4MHz,
PUT THE RADIO IN TEST MODE AND LOAD SYNTHETIZER WITH 33062# COMMAND.



NO SERVICE AT -102dBm


1
IS RX5 153MHz CORRECT ON R426?
NO
RX REPAIR 5
YES
IS RX6 153MHz CORRECT ON C421?
NO
RX REPAIR 6
YES
IS RX7 153MHz CORRECT ON PIN 31 OF U201?
NO
RX REPAIR 7
YES
ARE RXI AND RXQ CORRECT AT PIN 14 AND 15 OF U501?
NO
RX REPAIR 8
YES
ARE THE SPI ACTIVITY PRESENT AT PIN 4, 6 AND 8 OF U501?
NO
RX REPAIR 9
YES
TRY TO REPHASE VIA GATE 22, IF STILL NO FUNCTION CHANGE U501. IF ANY MENTIONED ACTION RESOLVE THE PROBLEM RETURN PCB TO HI-TECH CENTRE.

NO SERVICE AT -102dBm

RX1: FROM ANTENNA PORT CHECK L439, C440 FOR BAD SOLDER AND AFTER REPLACE U400. FROM SWITCH RF CHECK L443, C442 FOR BAD SOLDER AND AFTER REPLACE U400.

RX2:CHECK IF FL451 IS POSITIONED CORRECTLY OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL451.

RX3:TAKES ON Q418 DC MEASUREMENT LIKE AS FOLLOWING:

1.3V B

Q 418 **C 2.7V**

0.5V E

IF THE COLLECTOR IS NOT SUPLLY BY RX275, CHECK Q203 AND ASSOCIATE CIRCUITRY.AFTER REPLACE Q203.

IF THE COLLECTOR IS SUPLLY BY RX275 FROM Q203 CHECK L412, R432 AND AFTER REPLACE Q418.

RX4:CHECK FL452 FOR PHICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL452.

RX5: TAKES ON Q420 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

1V B

Q 420 **C 2.7V**

0.37 E

IF THE COLLECTOR IS NOT SUPPLY BY RX275, CHECK L414 AND AFTER REPLACE Q203.

IF THE COLLECTOR SUPLLY IS CORRECT REPLACE Q420.

RX6:CHECK FL420 IF IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL420.

RX7:TAKES ON Q421 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

0V B

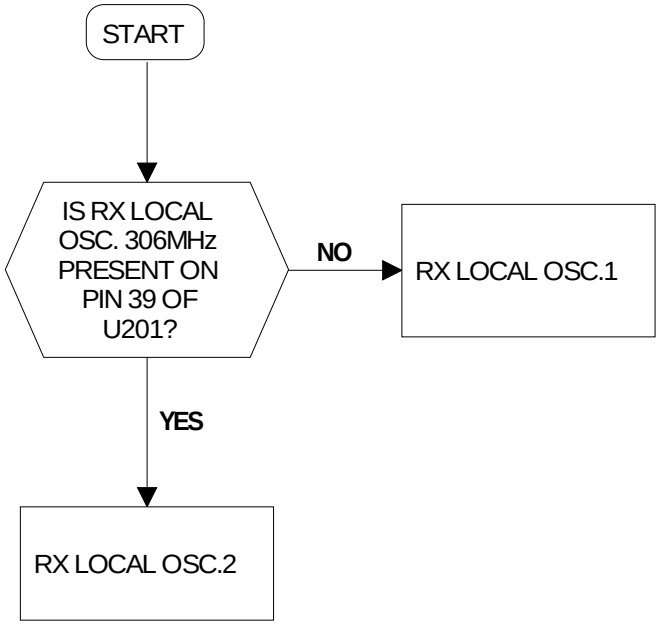
Q 421 **C 1.9V**

0.6V E

IF THE COLLECTOR SUPPLY IS CORRECT REPLACE Q421.

IF THE COLLECTOR IS NOT SUPPLY BY PIN 33 OF U201, CHECK R423 AND AFTER REPLACE U201.

RX:8



RX9:IF THERE IS NOT ACTIVITY ON SPI BUS TRY TO REPHASE AND AFTER REPLACE U501.

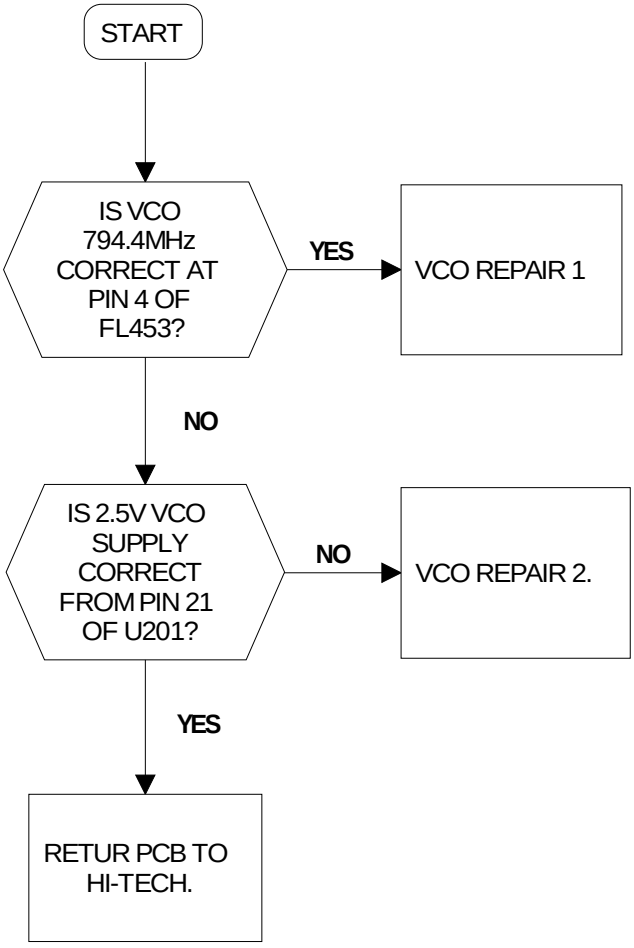
RX LOCAL OSC.1:CHECK FOR CR431, L433 AND U201 PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U201.

RX LOCAL OSC.2:CHECK IQ_ REF FROM PIN 16 OF U501 TO PIN47 OF U201, 1.38V IS CORRECT CONTROL FROM MODEM.

IF THE CONTROL IS CORRECT CHANGE U201.

IF THE CONTROL IS NOT CORRECT, TRY TO REPHASE AND AFTER REPLACE U501.

VCO REPAIR:

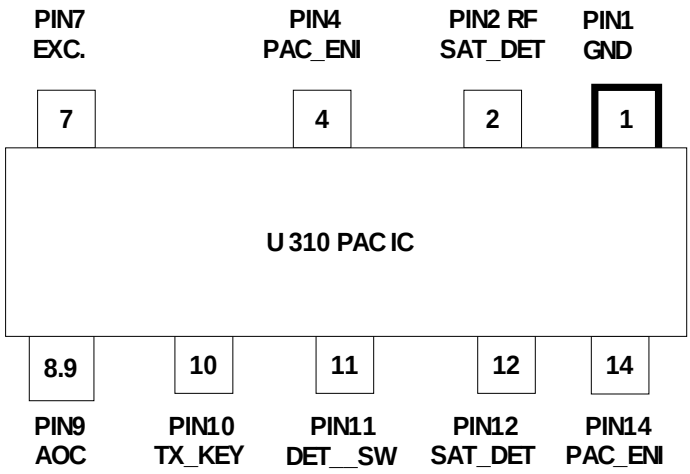


VCO REPAIR 1:CHECK IF FL453 IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL453.

VCO REPAIR 2:CHECK SUPPLIES FROM Q203 AND Q202. IF THEY ARE INCORRECT TAKES REFERENCE FROM A FULLY FUNCTIONALLY PCB TO DECIPHER WHICH COMPONENTS CAUSES NO OR POOR SUPER FILTER SUPPLY FOR VCO.POSSIBLE DEFECTIVE COMPONENTS ARE Q202, Q203,C212,C214 AND U201.

POWER BURST OUT OF SPEC.

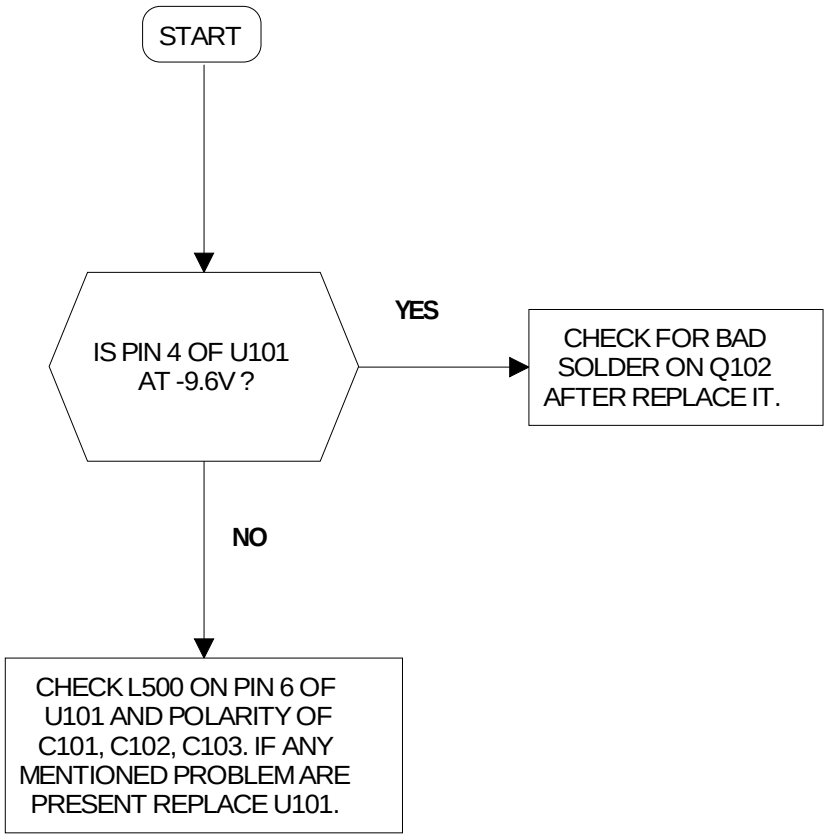
FOLLOWING THE SCHEMATIC OF PAC_IC U310 CHECK THE PIN 7 (PA CONTROL) IF IS CORRECT REPLACE Q301, Q302. IF IS NOT CORRECT CHECK THE OTHER PIN TO TRACE THE FAULTY LINE.

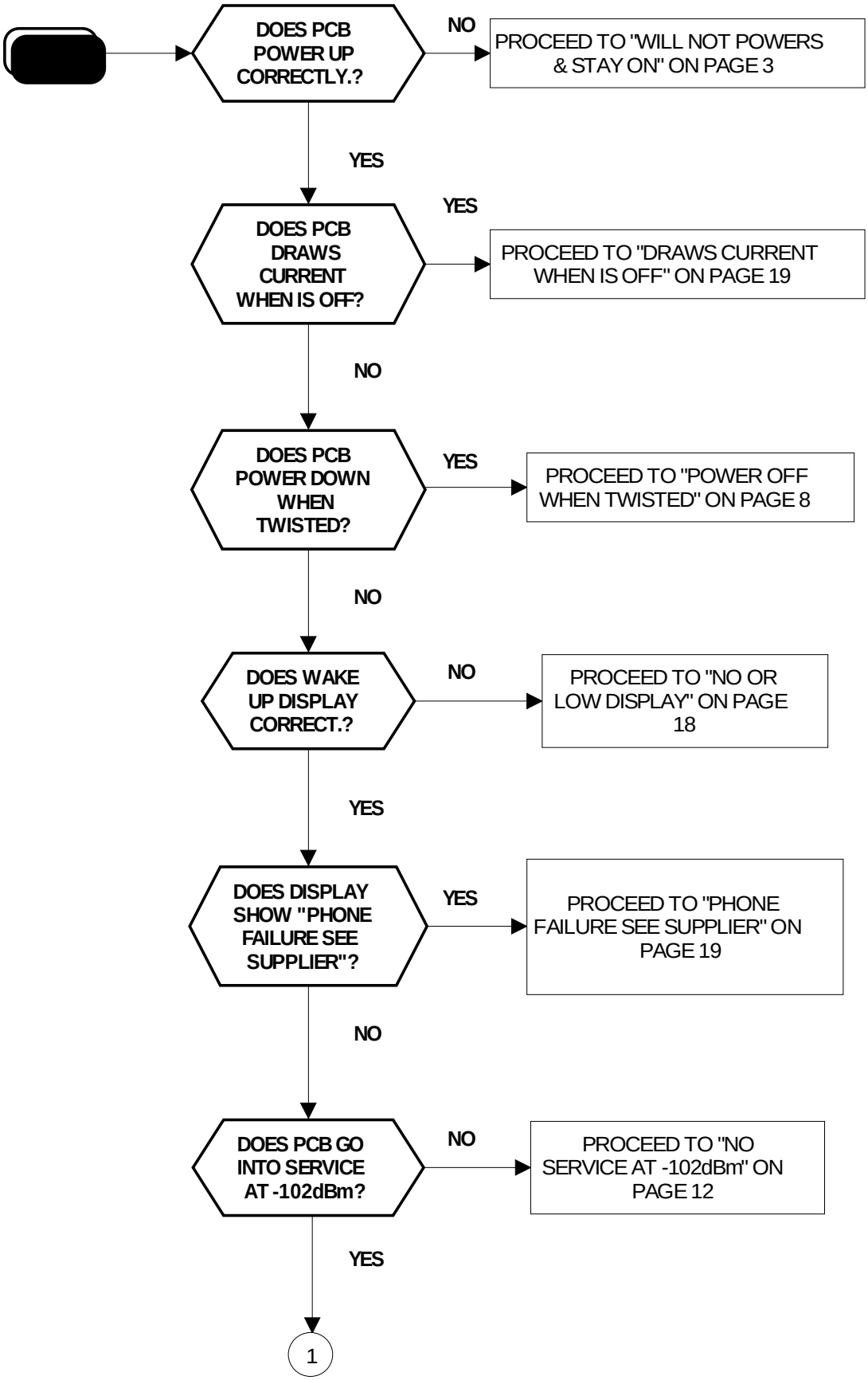


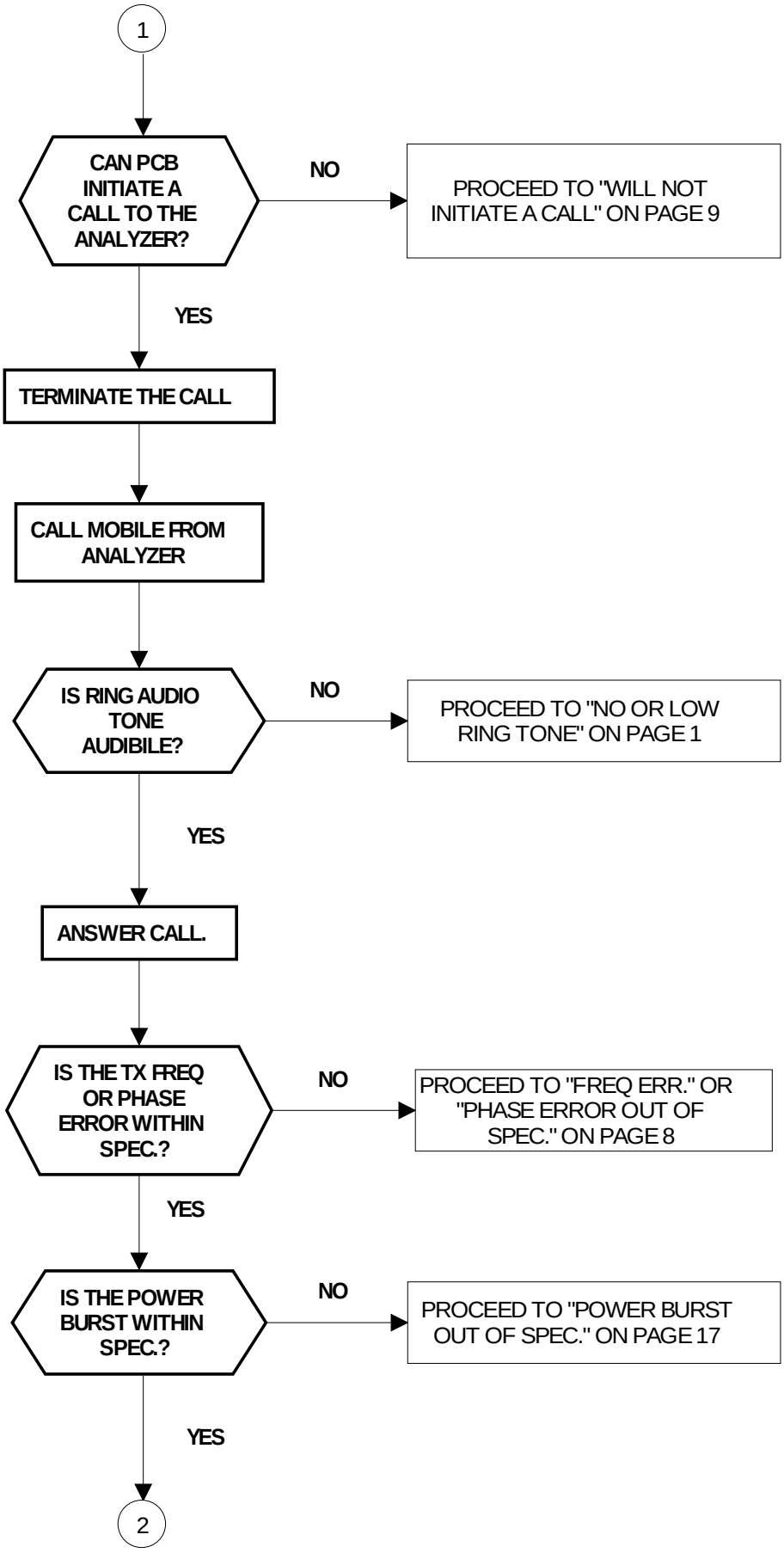
IF ANY MENTIONED PROBLEMS ARE PRESENT RETURN PCB TO HI-TECH.

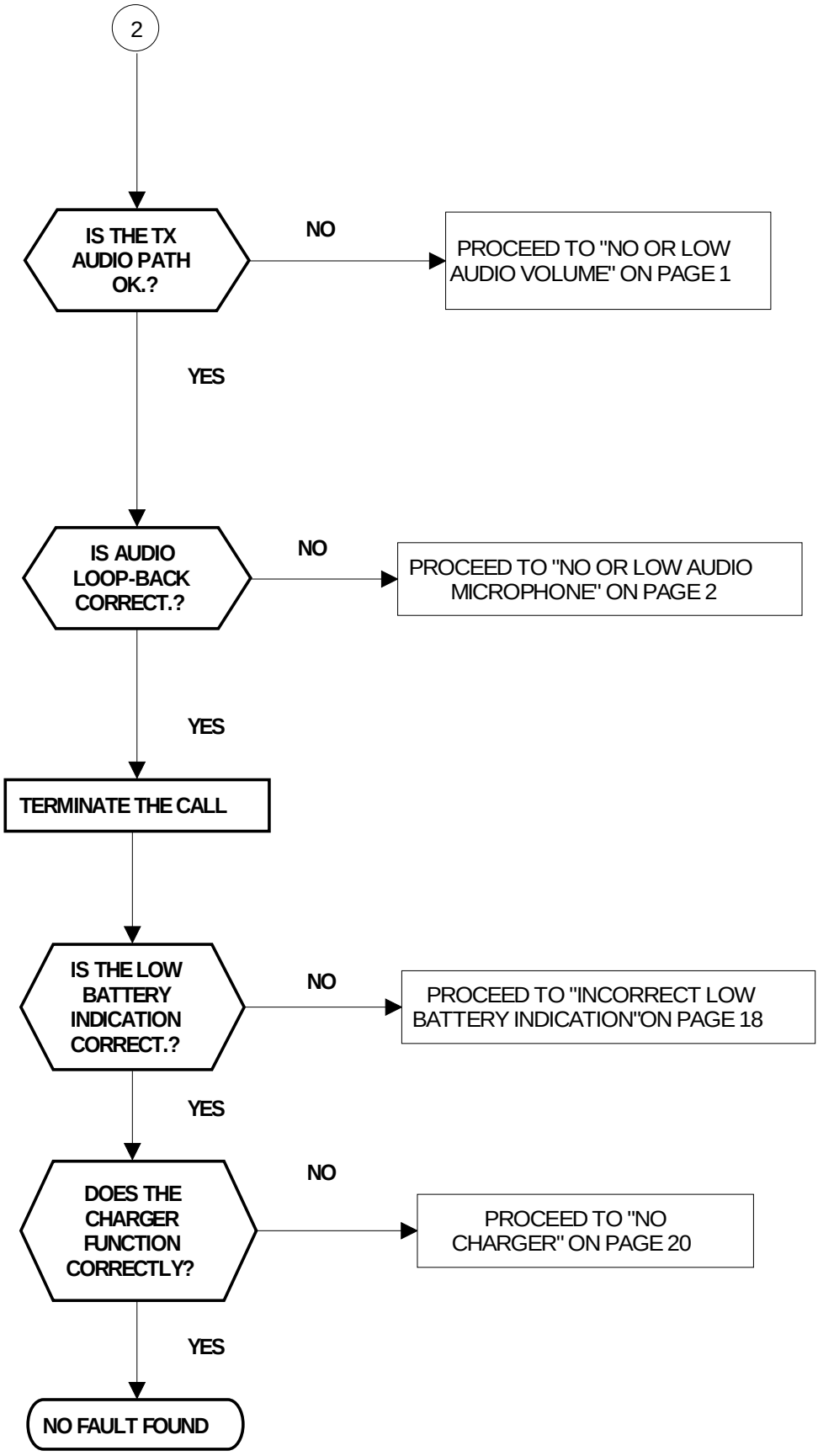
INCORRECT LOW BATTERY INDICATION

NO OR LOW DISPLAY



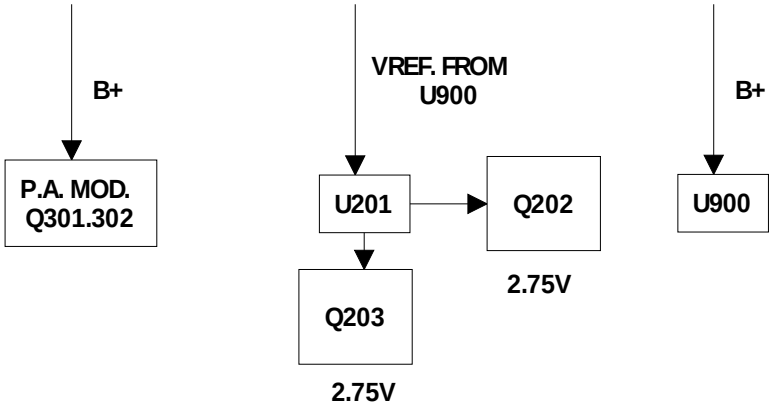

DOES PCB POWER UP CORRECTLY.?
NO
PROCEED TO "WILL NOT POWERS & STAY ON" ON PAGE 3
YES
DOES PCB DRAWS CURRENT WHEN IS OFF?
YES
PROCEED TO "DRAWS CURRENT WHEN IS OFF" ON PAGE 19
NO
DOES PCB POWER DOWN WHEN TWISTED?
YES
PROCEED TO "POWER OFF WHEN TWISTED" ON PAGE 8
NO
DOES WAKE UP DISPLAY CORRECT.?
NO
PROCEED TO "NO OR LOW DISPLAY" ON PAGE 18
YES
DOES DISPLAY SHOW "PHONE FAILURE SEE SUPPLIER"?
YES
PROCEED TO "PHONE FAILURE SEE SUPPLIER" ON PAGE 19
NO
DOES PCB GO INTO SERVICE AT -102dBm?
NO
PROCEED TO "NO SERVICE AT -102dBm" ON PAGE 12
YES
1


1
CAN PCB INITIATE A CALL TO THE ANALYZER?
NO
PROCEED TO "WILL NOT INITIATE A CALL" ON PAGE 9
YES
TERMINATE THE CALL
CALL MOBILE FROM ANALYZER
IS RING AUDIO TONE AUDIBILE?
NO
PROCEED TO "NO OR LOW RING TONE" ON PAGE 1
YES
ANSWER CALL.
IS THE TX FREQ OR PHASE ERROR WITHIN SPEC.?
NO
PROCEED TO "FREQ ERR." OR "PHASE ERROR OUT OF SPEC." ON PAGE 8
YES
IS THE POWER BURST WITHIN SPEC.?
NO
PROCEED TO "POWER BURST OUT OF SPEC." ON PAGE 17
YES
2

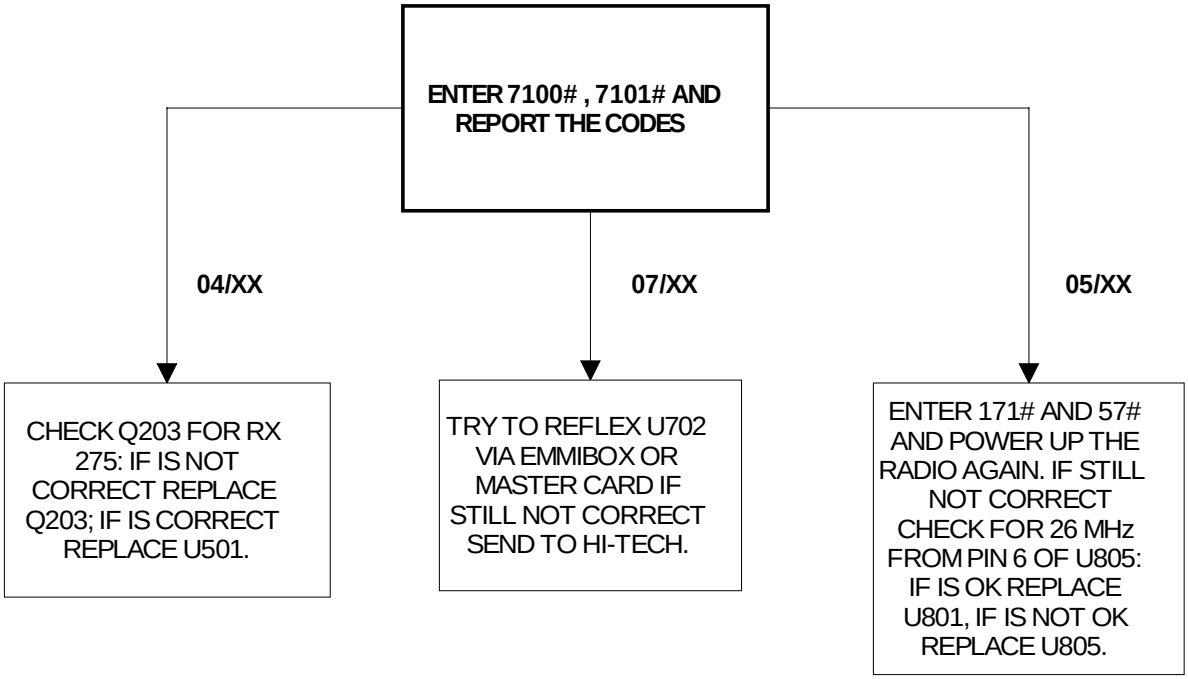

2
IS THE TX AUDIO PATH OK.?
NO
PROCEED TO "NO OR LOW AUDIO VOLUME" ON PAGE 1
YES
IS AUDIO LOOP-BACK CORRECT.?
NO
PROCEED TO "NO OR LOW AUDIO MICROPHONE" ON PAGE 2
YES
TERMINATE THE CALL
IS THE LOW BATTERY INDICATION CORRECT.?
NO
PROCEED TO "INCORRECT LOW BATTERY INDICATION"ON PAGE 18
YES
DOES THE CHARGER FUNCTION CORRECTLY?
NO
PROCEED TO "NO CHARGER" ON PAGE 20
YES
NO FAULT FOUND

PCB DRAWS CURRENT WHEN IS OFF

CHECK TRANSISTOR REGULATOR: Q202, Q203 AND U201 ARE NOT PHISCALLY DAMAGE; CHECK ALSO U900 TO MONITORING WHICH COMPONENT BECOMING WARMER AFTER REPLACE IT.

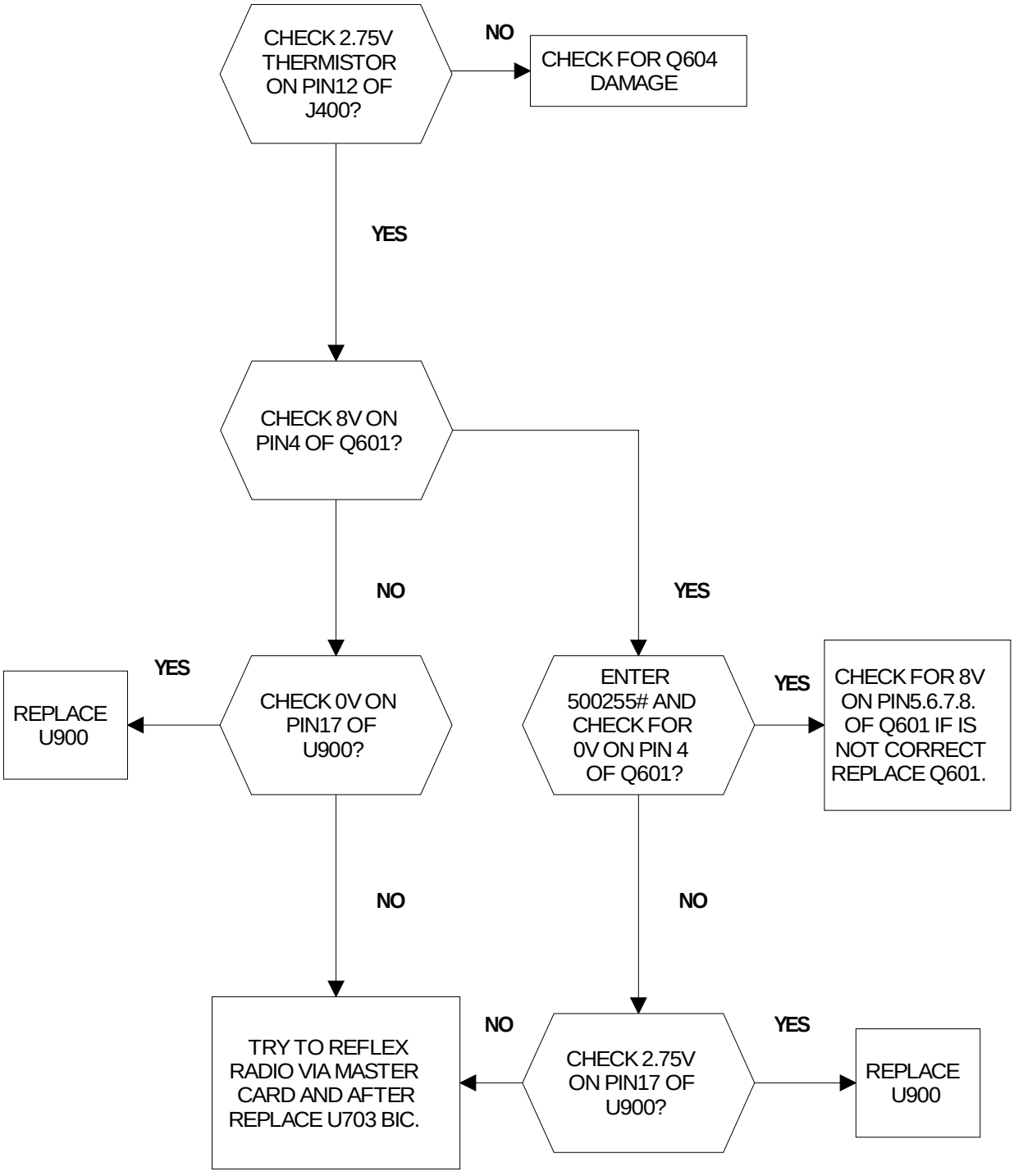


PHONE FAILED SEE SUPPLIER

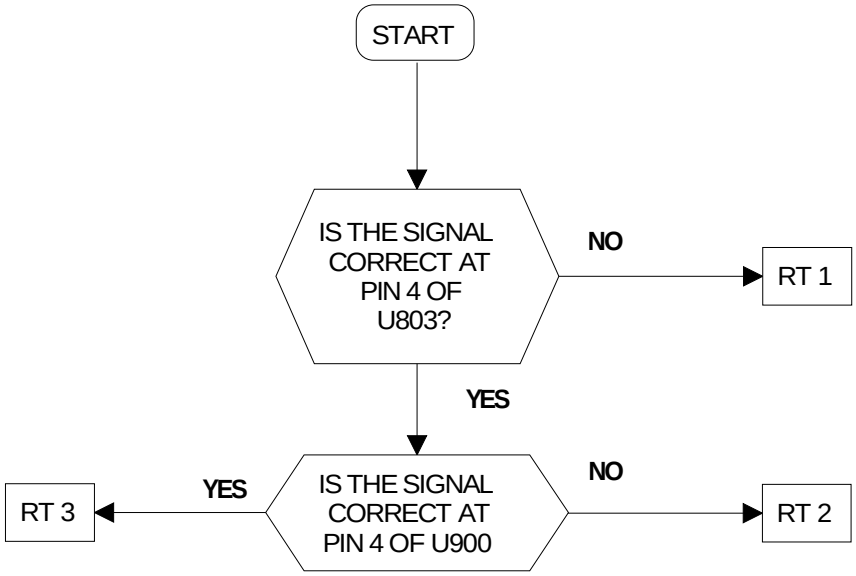

ENTER 7100# , 7101# AND REPORT THE CODES
04/XX
07/XX
05/XX
CHECK Q203 FOR RX 275: IF IS NOT CORRECT REPLACE Q203; IF IS CORRECT REPLACE U501.
TRY TO REFLEX U702 VIA EMMIBOX OR MASTER CARD IF STILL NOT CORRECT SEND TO HI-TECH.
ENTER 171# AND 57# AND POWER UP THE RADIO AGAIN. IF STILL NOT CORRECT CHECK FOR 26 MHz FROM PIN 6 OF U805: IF IS OK REPLACE U801, IF IS NOT OK REPLACE U805.

NO CHARGER

TEST CONDICTION: RADIO SUPPLY FROM EXT B+ AND IN TEST-MODE


CHECK 2.75V THERMISTOR ON PIN12 OF J400?
NO
CHECK FOR Q604 DAMAGE
YES
CHECK 8V ON PIN4 OF Q601?
NO
YES
CHECK 0V ON PIN17 OF U900?
YES
REPLACE U900
ENTER 500255# AND CHECK FOR 0V ON PIN 4 OF Q601?
YES
CHECK FOR 8V ON PIN5.6.7.8. OF Q601 IF IS NOT CORRECT REPLACE Q601.
NO
NO
TRY TO REFLEX RADIO VIA MASTER CARD AND AFTER REPLACE U703 BIC.
NO
CHECK 2.75V ON PIN17 OF U900?
YES
REPLACE U900

NO OR LOW RING TONE

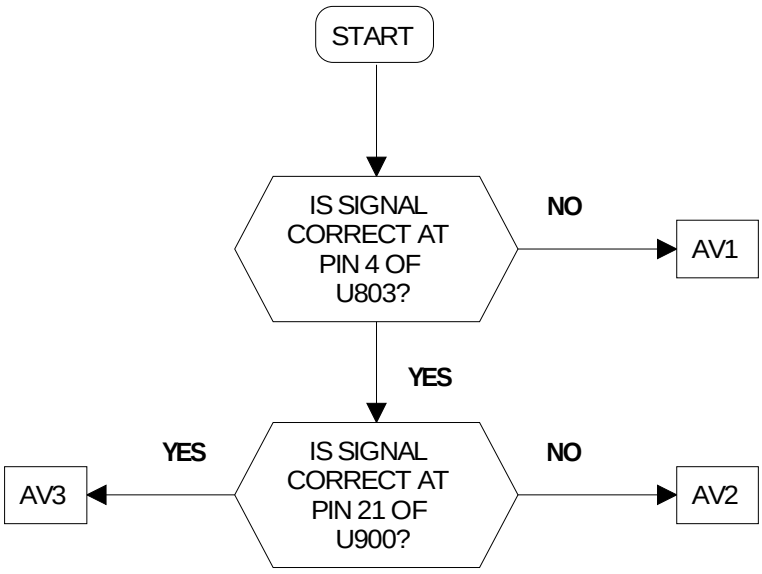


RT1: CHECK IF U801 IS POSITIONED CORRECTLY OR BAD SOLDER, IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U801

RT2: CHECK IF U802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER ALSO CHECK C825,C817 AND R803. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803

RT3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 4.5.6.7, CHECK ALSO PIN CONNECTOR 5.7 OF J2. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO VOLUME

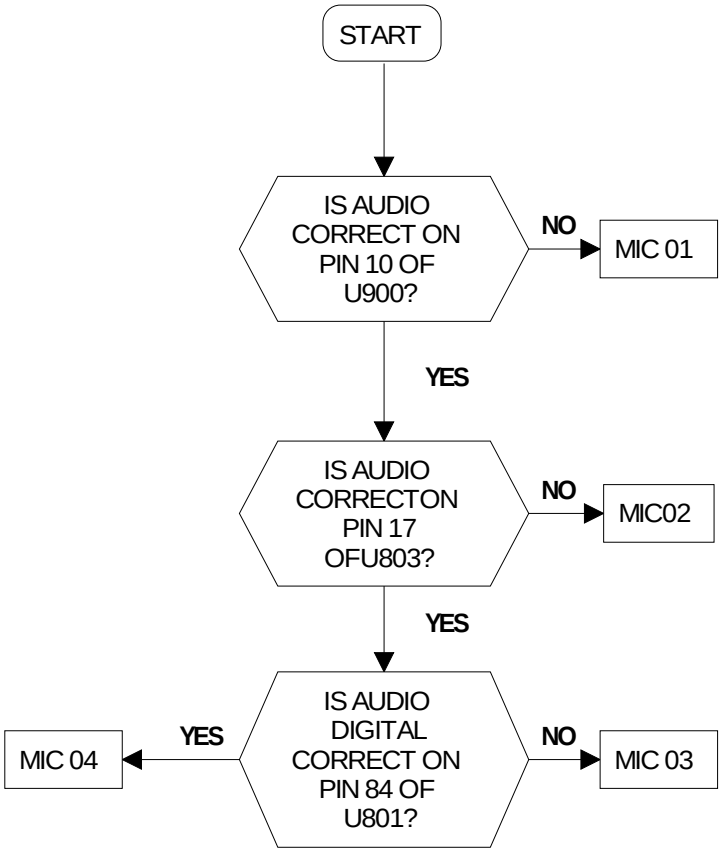


AV1: CHECK IF U801 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV2: CHECK IFU802 AND U803 ARE POSITIONED CORRECTLY OR BAD SOLDER, ALSO CHECK C825 AND R810. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U803.

AV3: CHECK IF U900 IS POSITIONED CORRECTLY OR BAD SOLDER AT PIN 19.20.21, PIN CONNECTOR 22.20 OF J2 AND R802,R810,C804 AND C825. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NO OR LOW AUDIO MICROPHONE

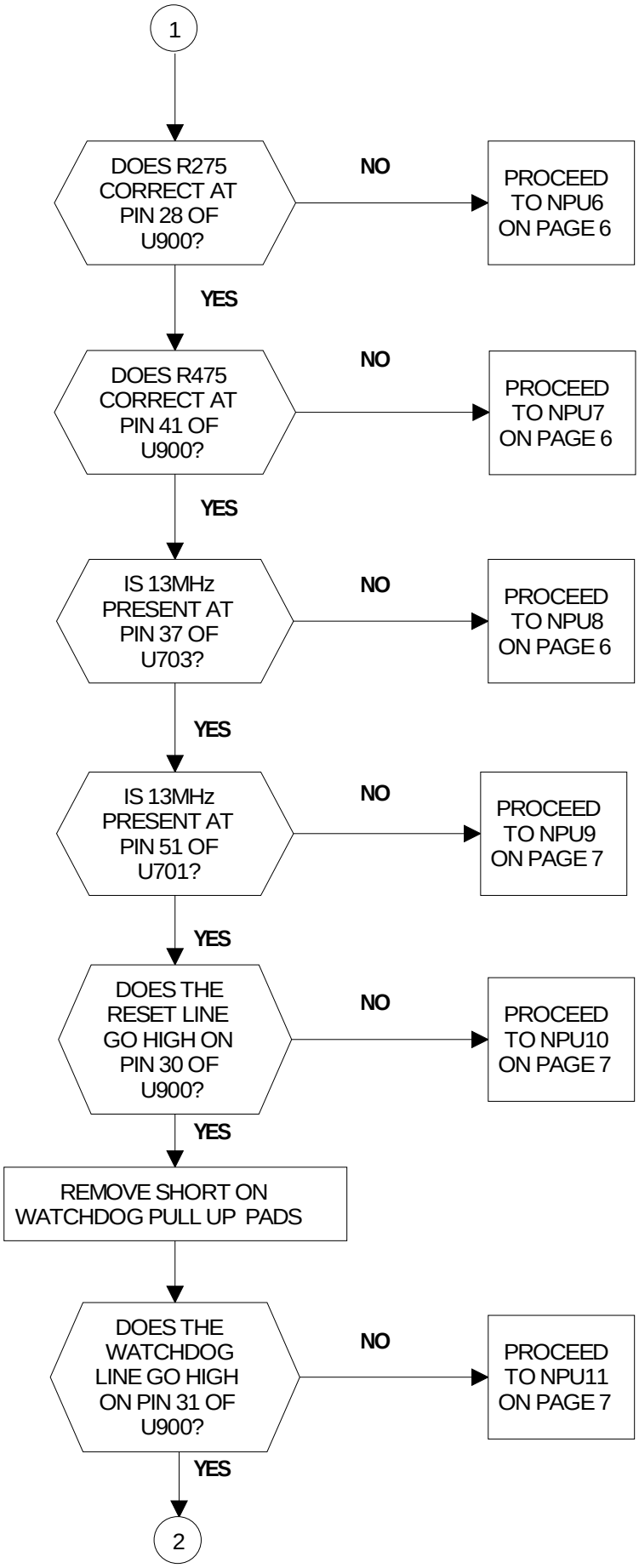


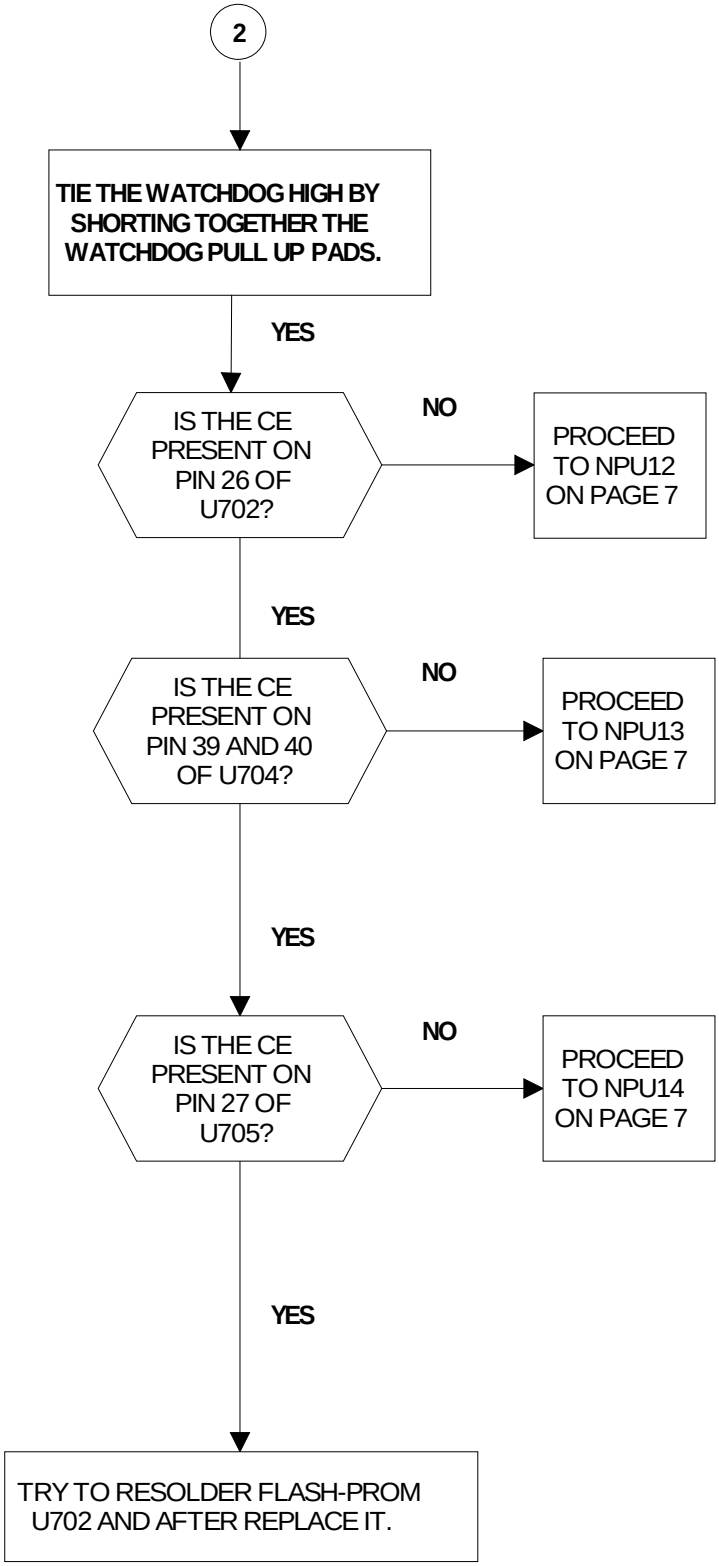
MIC 01: CHECK J802, C810, C813, C808, R806, R805 FOR BAD SOLDER.

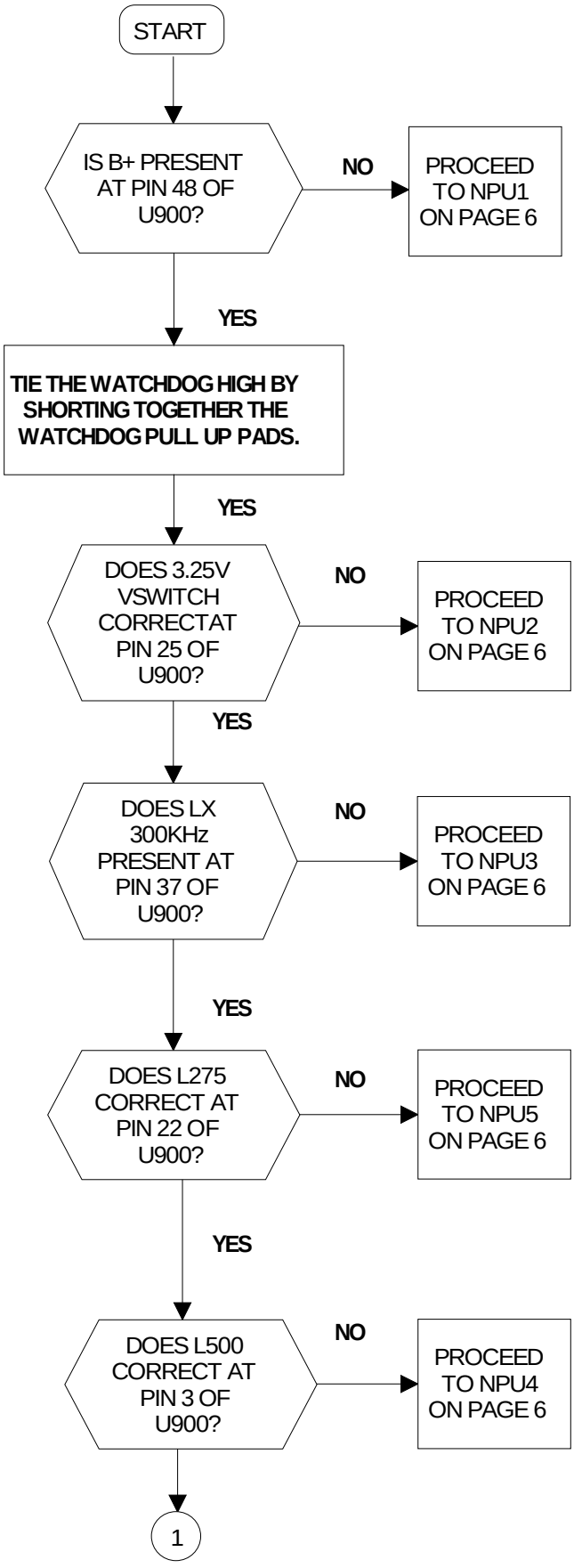
MIC02: CHECK VOLTAGE ON PIN 17/18/19/20 OF U803, IS ABOUT 2.4V, IF IS NOT CORRECT REPLACE C832 AND C848; IF IS CORRECT CHECK U900 AND AFTER REPLACE IT.

MIC 03: CHECK IF U803 AND R838, R842, R841 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U803.

MIC 04: CHECK IF U801 AND R845 ARE POSITIONED CORRECTLY OR BAD SOLDER AFTER REPLACE U801.


1
DOES R275 CORRECT AT PIN 28 OF U900?
NO
PROCEED TO NPU6 ON PAGE 6
YES
DOES R475 CORRECT AT PIN 41 OF U900?
NO
PROCEED TO NPU7 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 37 OF U703?
NO
PROCEED TO NPU8 ON PAGE 6
YES
IS 13MHz PRESENT AT PIN 51 OF U701?
NO
PROCEED TO NPU9 ON PAGE 7
YES
DOES THE RESET LINE GO HIGH ON PIN 30 OF U900?
NO
PROCEED TO NPU10 ON PAGE 7
YES
REMOVE SHORT ON WATCHDOG PULL UP PADS
DOES THE WATCHDOG LINE GO HIGH ON PIN 31 OF U900?
NO
PROCEED TO NPU11 ON PAGE 7
YES
2


2
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
IS THE CE PRESENT ON PIN 26 OF U702?
NO
PROCEED TO NPU12 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 39 AND 40 OF U704?
NO
PROCEED TO NPU13 ON PAGE 7
YES
IS THE CE PRESENT ON PIN 27 OF U705?
NO
PROCEED TO NPU14 ON PAGE 7
YES
TRY TO RESOLDER FLASH-PROM U702 AND AFTER REPLACE IT.


START
IS B+ PRESENT AT PIN 48 OF U900?
NO
PROCEED TO NPU1 ON PAGE 6
YES
TIE THE WATCHDOG HIGH BY SHORTING TOGETHER THE WATCHDOG PULL UP PADS.
YES
DOES 3.25V VSWITCH CORRECTAT PIN 25 OF U900?
NO
PROCEED TO NPU2 ON PAGE 6
YES
DOES LX 300KHz PRESENT AT PIN 37 OF U900?
NO
PROCEED TO NPU3 ON PAGE 6
YES
DOES L275 CORRECT AT PIN 22 OF U900?
NO
PROCEED TO NPU5 ON PAGE 6
YES
DOES L500 CORRECT AT PIN 3 OF U900?
NO
PROCEED TO NPU4 ON PAGE 6
1

POWERS OFF WHEN TWISTED

CHECK Y201, CR201, U201, U702, U704 FOR POSITIONED CORRECTLY OR BAD SOLDER

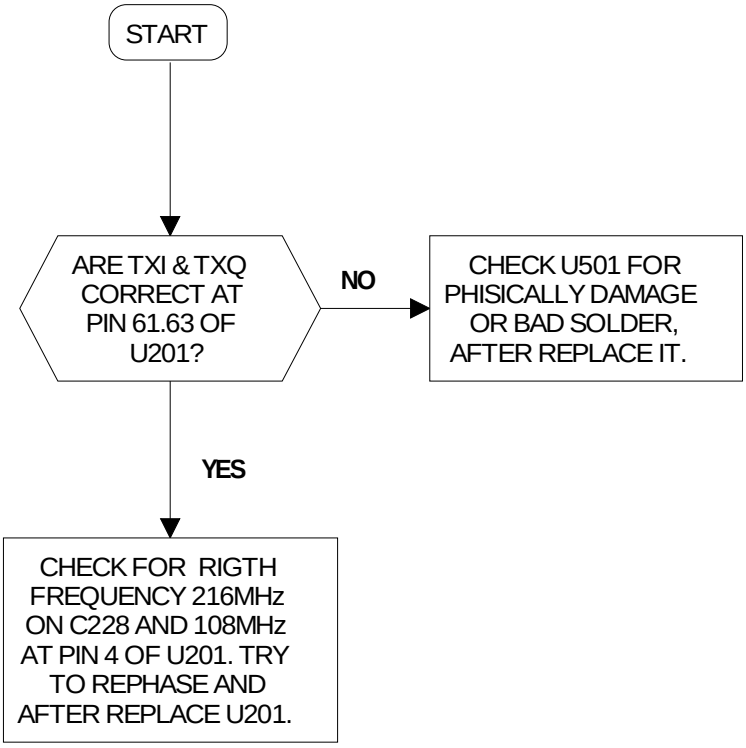
WILL NOT POWERS DOWN

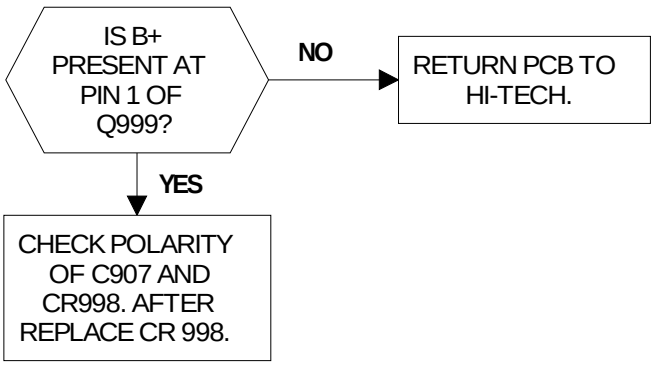
CHECK IF THERE ISN'T ANY SHORT ON WATCHDOG PULL UP PADS. CHECK ALSO CONNECTION FROM PIN 25 OF J2 TO R990 OR BAD SOLDER ON U900. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

FREQUENCY ERROR OUT OF SPEC.

CHECK Y201 AND CR 201 FOR PHISICALLY DAMAGE OR BAD SOLDER.

PHASE ERROR OUT OF SPEC.


START
ARE TXI & TXQ CORRECT AT PIN 61.63 OF U201?
NO
CHECK U501 FOR PHISICALLY DAMAGE OR BAD SOLDER, AFTER REPLACE IT.
YES
CHECK FOR RIGTH FREQUENCY 216MHz ON C228 AND 108MHz AT PIN 4 OF U201. TRY TO REPHASE AND AFTER REPLACE U201.



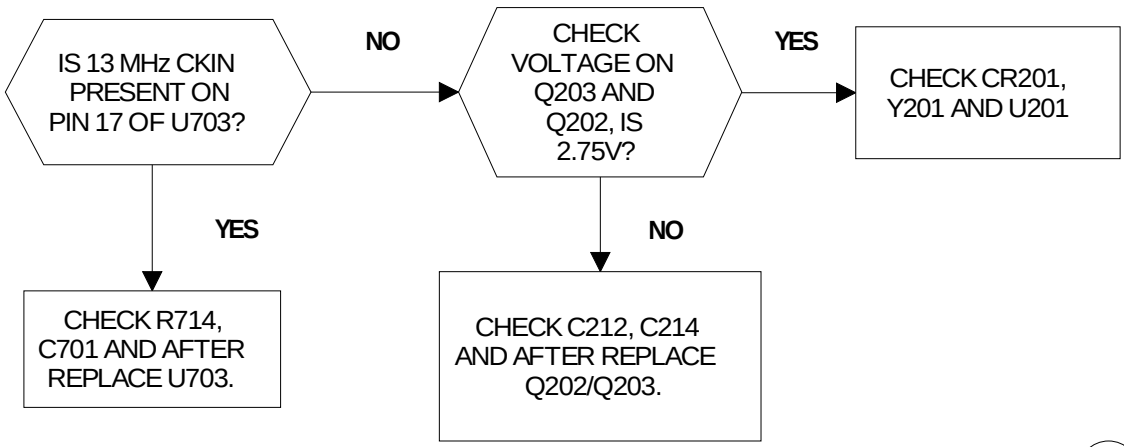
NPU3: CHECK CR910 C916 FOR POLARITY AFTER REPLACE T900.

NPU4: CHECK POLARITY OF C901 AND AFTER REPLACE U900.

NPU6: CHECK C908 FOR SHORT CIRCUIT AND AFTER REPLACE U900.

NPU7: CHECK POLARITY OF C906 AND AFTER REPLACE U900.

NPU8:


IS 13 MHz CKIN PRESENT ON PIN 17 OF U703?
NO
CHECK VOLTAGE ON Q203 AND Q202, IS 2.75V?
YES
CHECK CR201, Y201 AND U201
YES
NO
CHECK R714, C701 AND AFTER REPLACE U703.
CHECK C212, C214 AND AFTER REPLACE Q202/Q203.

NPU9: CHECK TRACK FROM R714 TO PIN 51 OF U701.

NPU10: CHECK SOLDER ON U900, TRY TO RESOLDER U702
OR CONNECT RADIO TO THE EMMIBOX FOR UPGRADE.

NPU11: CHECK WATCHDOG LINE FROM PIN 31 OF U900 TO R741/PIN 56 OF U703, AND FROM PIN 31 OF U900 TO PIN 60 OF U701. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U900.

NPU12: U701 BEING SENT CE TO U704. CONTROL CE LINE FROM PIN 100 OF U701 TO PIN 26 OF U702, IF IS CORRECT REPLACE U702.

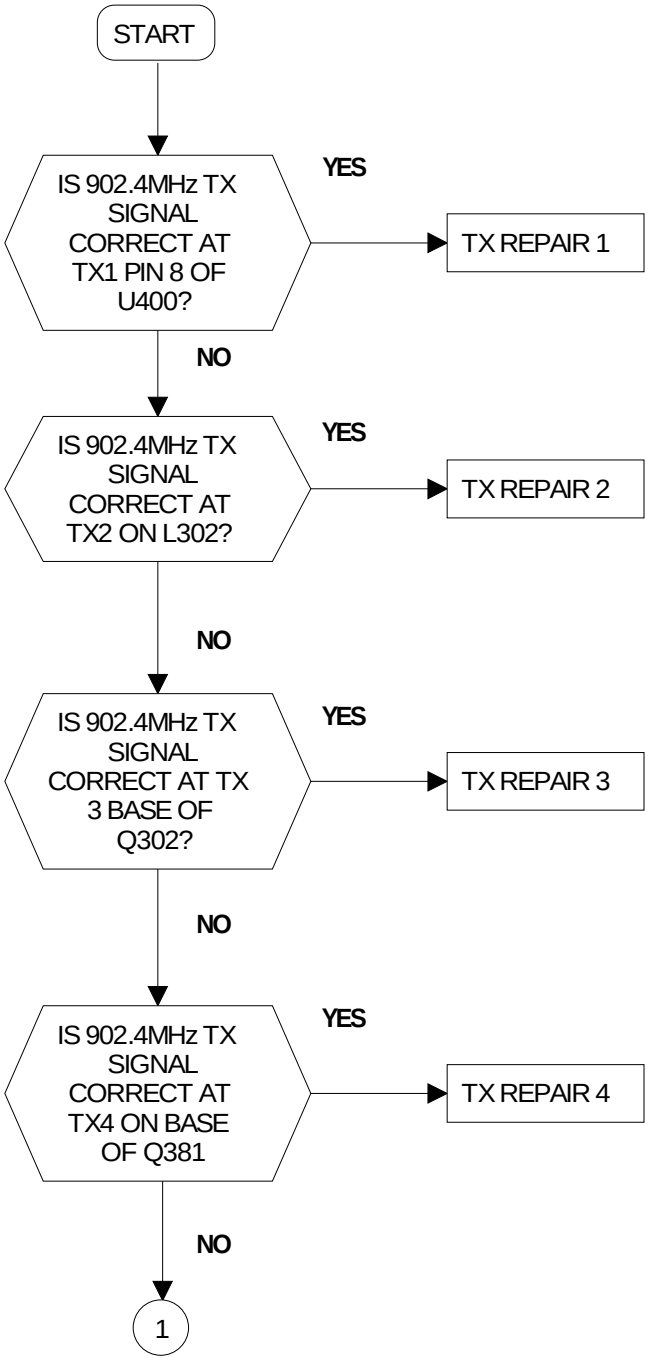
NPU13: U701 BEING SENT CE FROM PIN 102 TO PIN 40 OF U704. IF IS CORRECT REPLACE U704.

NPU14: U701 BEING SENT CE FROM PIN 114 TO PIN 27 OF U705 TRY
TO CONNECT RADIO TO THE EMMIBOX FOR UPGRADE THE RADIO.

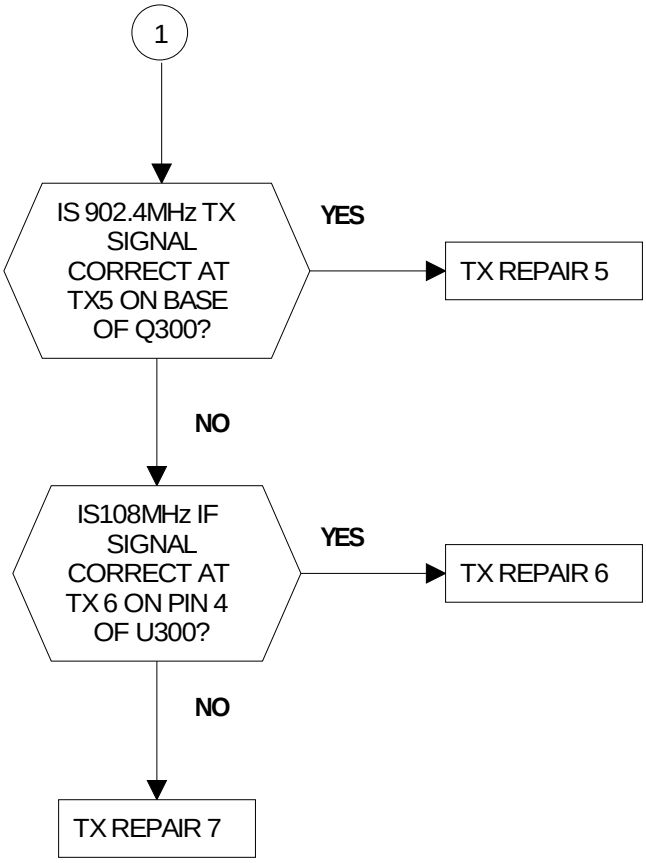
WILL NOT INITIATE A CALL

CONTINUOS
11062# 1215# 40#

IMPULSIVE
11062# 1200#
310#



WILL NOT INITIATE A CALL



TX1: CHECKC442, L433 AND AFTER REPLACE U400

TX2: CHECK C439, L302.303.304, C328 AND C329 FOR PHISICALLY DAMAGE OR BAD SOLDER.

TX3: CHECK IF B+ IS PRESENT ON COLLECTOR OF Q302 AND PIN 2.3 OF Q301. IF B+ IS CORRECT TRACE THE TX SIGNAL TROUGH THE PATH FROM Q302 TO Q301 TO DECIPHER WICH IS THE FAILURE COMPONENT.

TX4: TAKES DC VOLTAGE MEASUREMENT AS FOLLOWING:

E 0.3V

B+ C Q 381

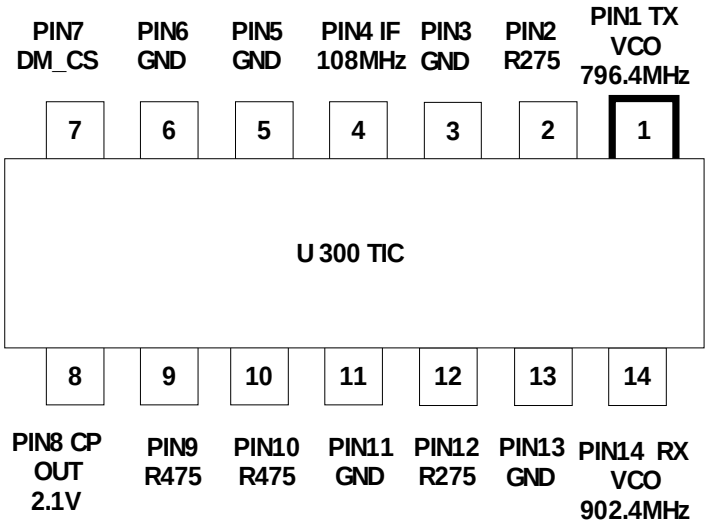
B 0.5V

IF THE COLLECTOR IS NOT SUPPLIED BY B+ CHANGE L380. IF B+ IS CORRECT REPLACE Q381.

WILL NOT INITIATE A CALL

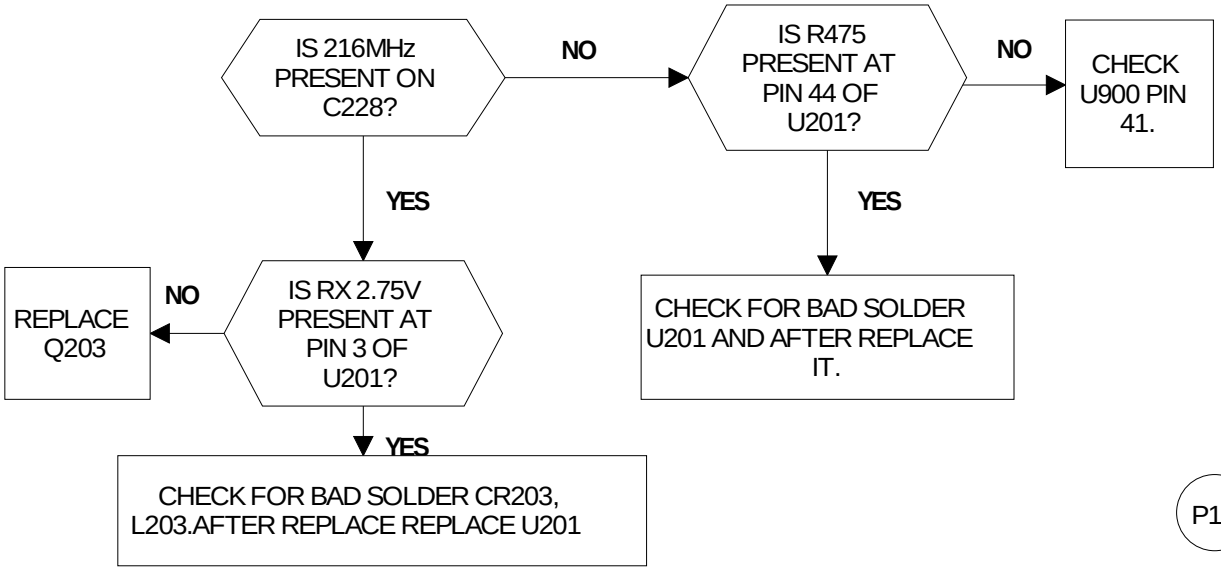
IF THE COLLECTOR IS NOT SUPLLIED BY 2.7V CHECK C 301.302.325. IF 2.7V ON COLLECTOR IS OK CHECK C 304.314.381 R352 AND AFTER REPLACE Q300.

TX6:



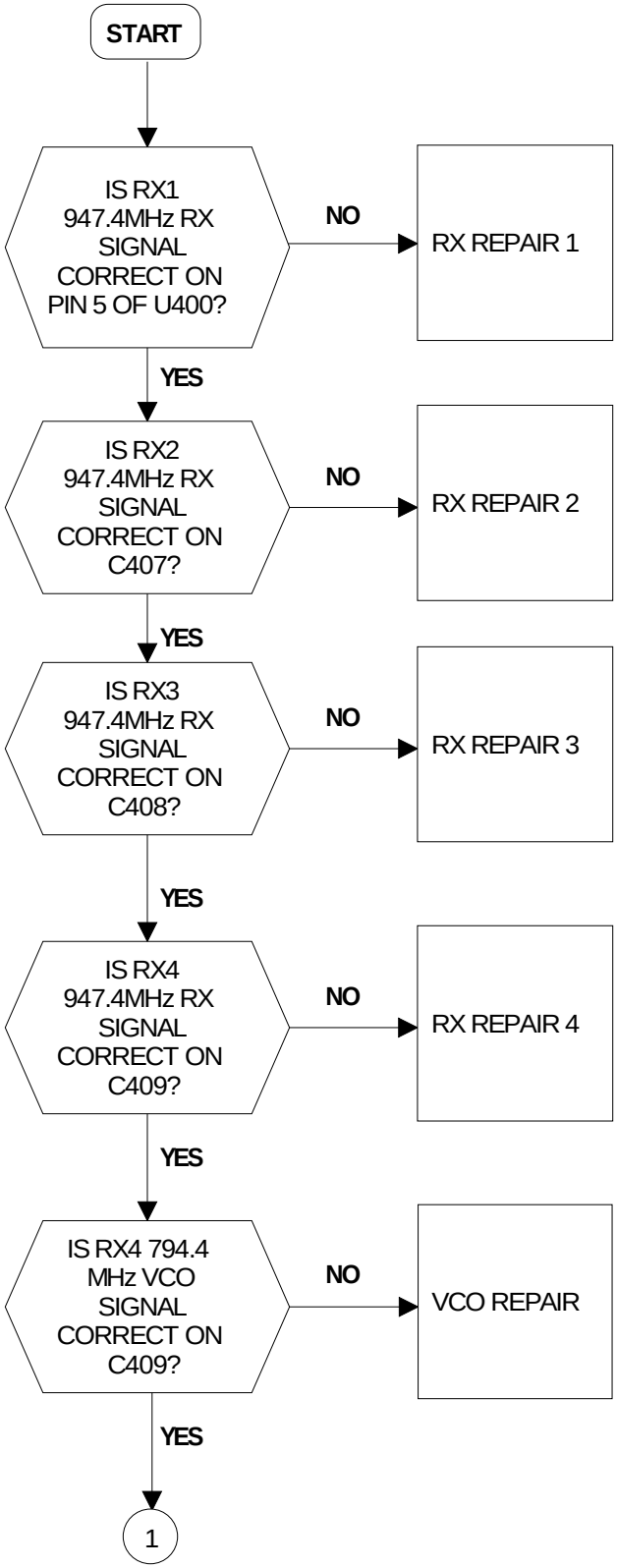
CHECK PRESENCE OF SIGAL FOLLOWING THE SCHEMATIC AS ABOVE TO DECIPHER WICH IS THE FAULTY LINE. IF EVERITHINGS ARE CORRECT REPLACE U300.

TX7:

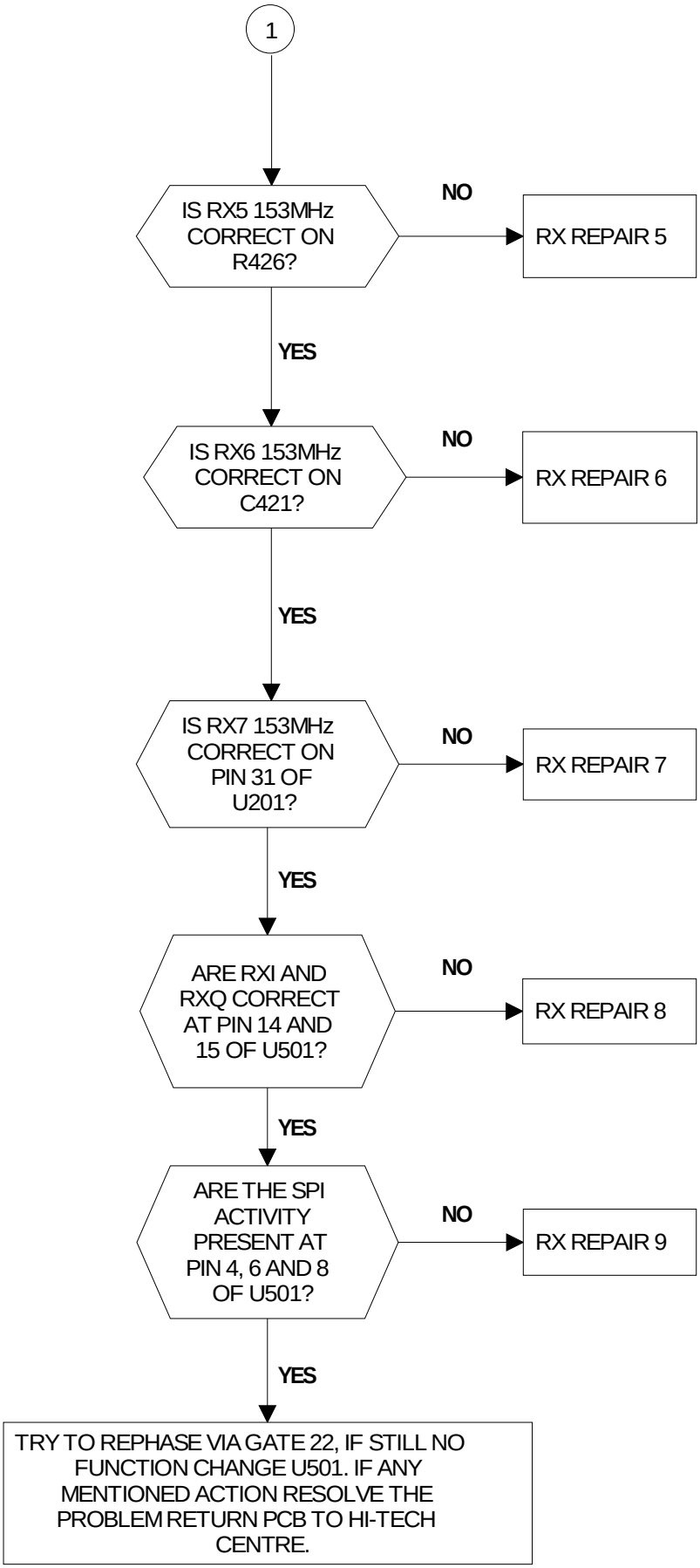

IS 216MHz PRESENT ON C228?
NO
IS R475 PRESENT AT PIN 44 OF U201?
NO
CHECK U900 PIN 41.
YES
YES
REPLACE Q203
NO
IS RX 2.75V PRESENT AT PIN 3 OF U201?
CHECK FOR BAD SOLDER U201 AND AFTER REPLACE IT.
YES
CHECK FOR BAD SOLDER CR203, L203.AFTER REPLACE REPLACE U201

NO SERVICE AT -102dBm

SET THE COMMUNICATIONANALYZER TO INJECT VIA ANTENNA PLUG -30dBm AT 947.4MHz,
PUT THE RADIO IN TEST MODE AND LOAD SYNTHETIZER WITH 33062# COMMAND.



NO SERVICE AT -102dBm


1
IS RX5 153MHz CORRECT ON R426?
NO
RX REPAIR 5
YES
IS RX6 153MHz CORRECT ON C421?
NO
RX REPAIR 6
YES
IS RX7 153MHz CORRECT ON PIN 31 OF U201?
NO
RX REPAIR 7
YES
ARE RXI AND RXQ CORRECT AT PIN 14 AND 15 OF U501?
NO
RX REPAIR 8
YES
ARE THE SPI ACTIVITY PRESENT AT PIN 4, 6 AND 8 OF U501?
NO
RX REPAIR 9
YES
TRY TO REPHASE VIA GATE 22, IF STILL NO FUNCTION CHANGE U501. IF ANY MENTIONED ACTION RESOLVE THE PROBLEM RETURN PCB TO HI-TECH CENTRE.

NO SERVICE AT -102dBm

RX1: FROM ANTENNA PORT CHECK L439, C440 FOR BAD SOLDER AND AFTER REPLACE U400. FROM SWITCH RF CHECK L443, C442 FOR BAD SOLDER AND AFTER REPLACE U400.

RX2:CHECK IF FL451 IS POSITIONED CORRECTLY OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL451.

RX3:TAKES ON Q418 DC MEASUREMENT LIKE AS FOLLOWING:

1.3V B

Q 418 **C 2.7V**

0.5V E

IF THE COLLECTOR IS NOT SUPLLY BY RX275, CHECK Q203 AND ASSOCIATE CIRCUITRY.AFTER REPLACE Q203.

IF THE COLLECTOR IS SUPLLY BY RX275 FROM Q203 CHECK L412, R432 AND AFTER REPLACE Q418.

RX4:CHECK FL452 FOR PHICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL452.

RX5: TAKES ON Q420 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

1V B

Q 420 **C 2.7V**

0.37 E

IF THE COLLECTOR IS NOT SUPPLY BY RX275, CHECK L414 AND AFTER REPLACE Q203.

IF THE COLLECTOR SUPLLY IS CORRECT REPLACE Q420.

RX6:CHECK FL420 IF IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL420.

RX7:TAKES ON Q421 DC MEASUREMENT VOLTAGE LIKE AS FOLLOWING:

0V B

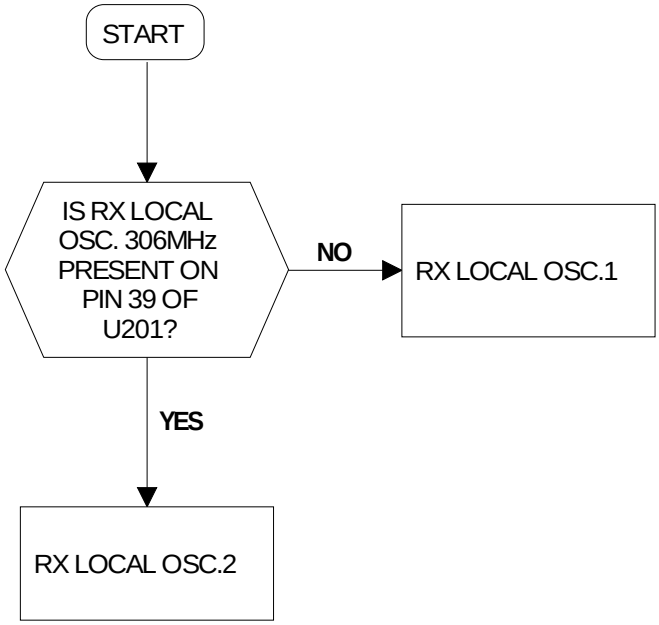
Q 421 **C 1.9V**

0.6V E

IF THE COLLECTOR SUPPLY IS CORRECT REPLACE Q421.

IF THE COLLECTOR IS NOT SUPPLY BY PIN 33 OF U201, CHECK R423 AND AFTER REPLACE U201.

RX:8



RX9:IF THERE IS NOT ACTIVITY ON SPI BUS TRY TO REPHASE AND AFTER REPLACE U501.

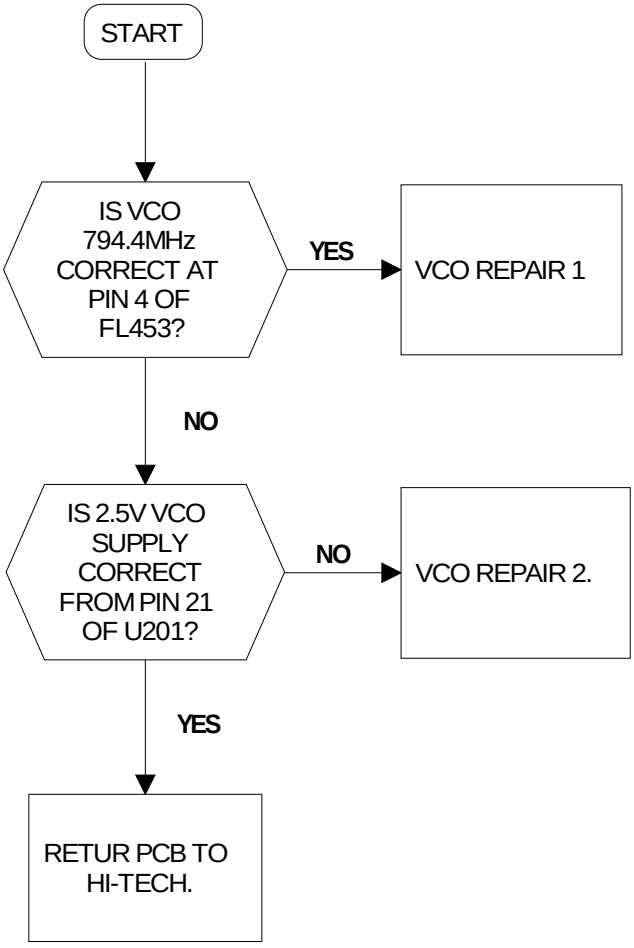
RX LOCAL OSC.1:CHECK FOR CR431, L433 AND U201 PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE U201.

RX LOCAL OSC.2:CHECK IQ_ REF FROM PIN 16 OF U501 TO PIN47 OF U201, 1.38V IS CORRECT CONTROL FROM MODEM.

IF THE CONTROL IS CORRECT CHANGE U201.

IF THE CONTROL IS NOT CORRECT, TRY TO REPHASE AND AFTER REPLACE U501.

VCO REPAIR:

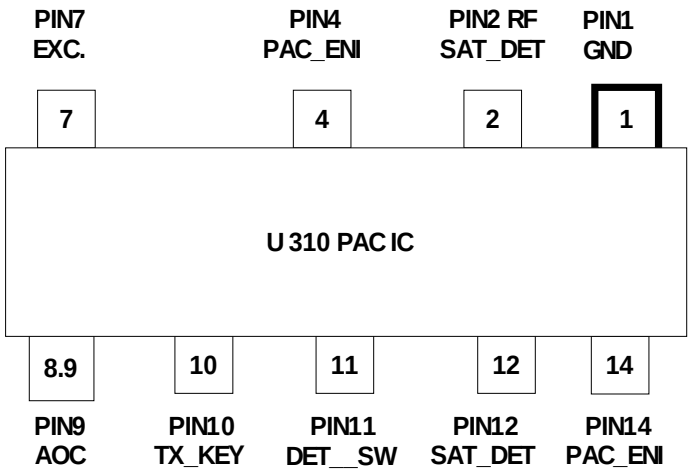


VCO REPAIR 1:CHECK IF FL453 IS NOT PHISICALLY DAMAGE OR BAD SOLDER. IF ANY MENTIONED PROBLEM ARE PRESENT REPLACE FL453.

VCO REPAIR 2:CHECK SUPPLIES FROM Q203 AND Q202. IF THEY ARE INCORRECT TAKES REFERENCE FROM A FULLY FUNCTIONALLY PCB TO DECIPHER WHICH COMPONENTS CAUSES NO OR POOR SUPER FILTER SUPPLY FOR VCO.POSSIBLE DEFECTIVE COMPONENTS ARE Q202, Q203,C212,C214 AND U201.

POWER BURST OUT OF SPEC.

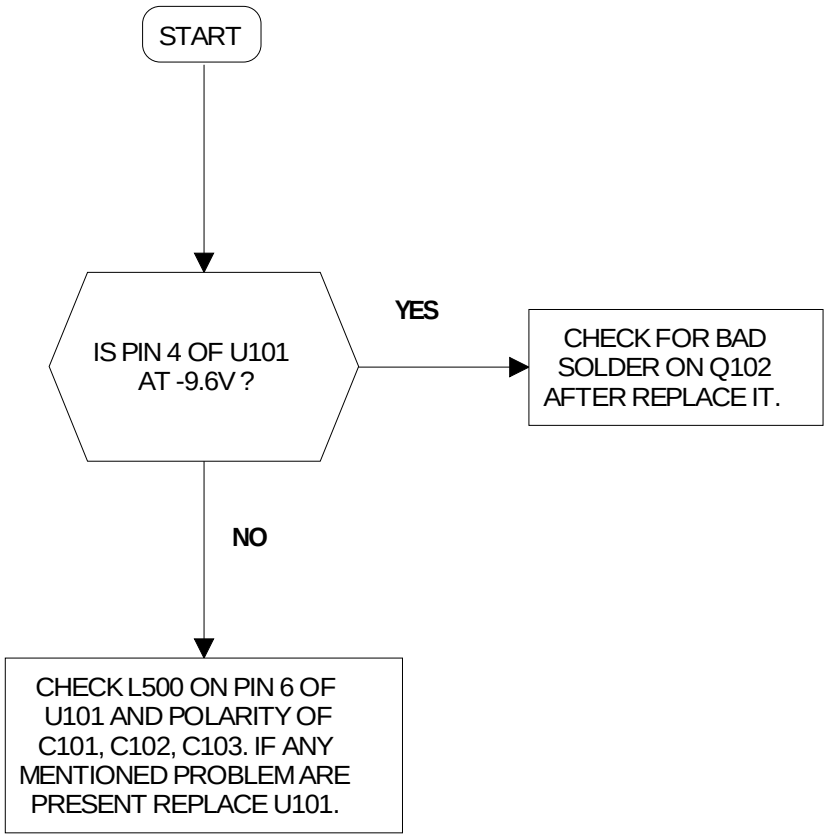
FOLLOWING THE SCHEMATIC OF PAC_IC U310 CHECK THE PIN 7 (PA CONTROL) IF IS CORRECT REPLACE Q301, Q302. IF IS NOT CORRECT CHECK THE OTHER PIN TO TRACE THE FAULTY LINE.

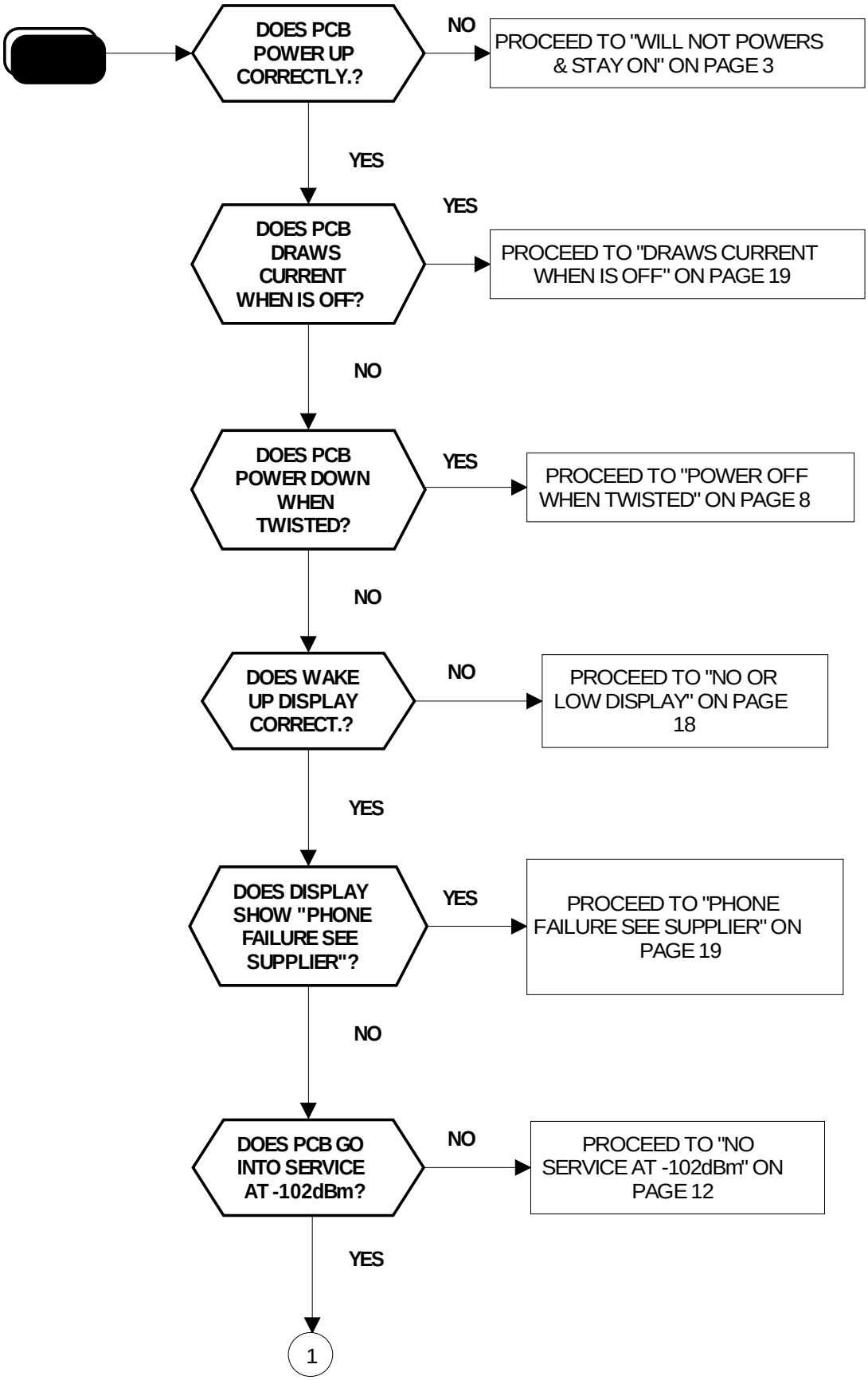


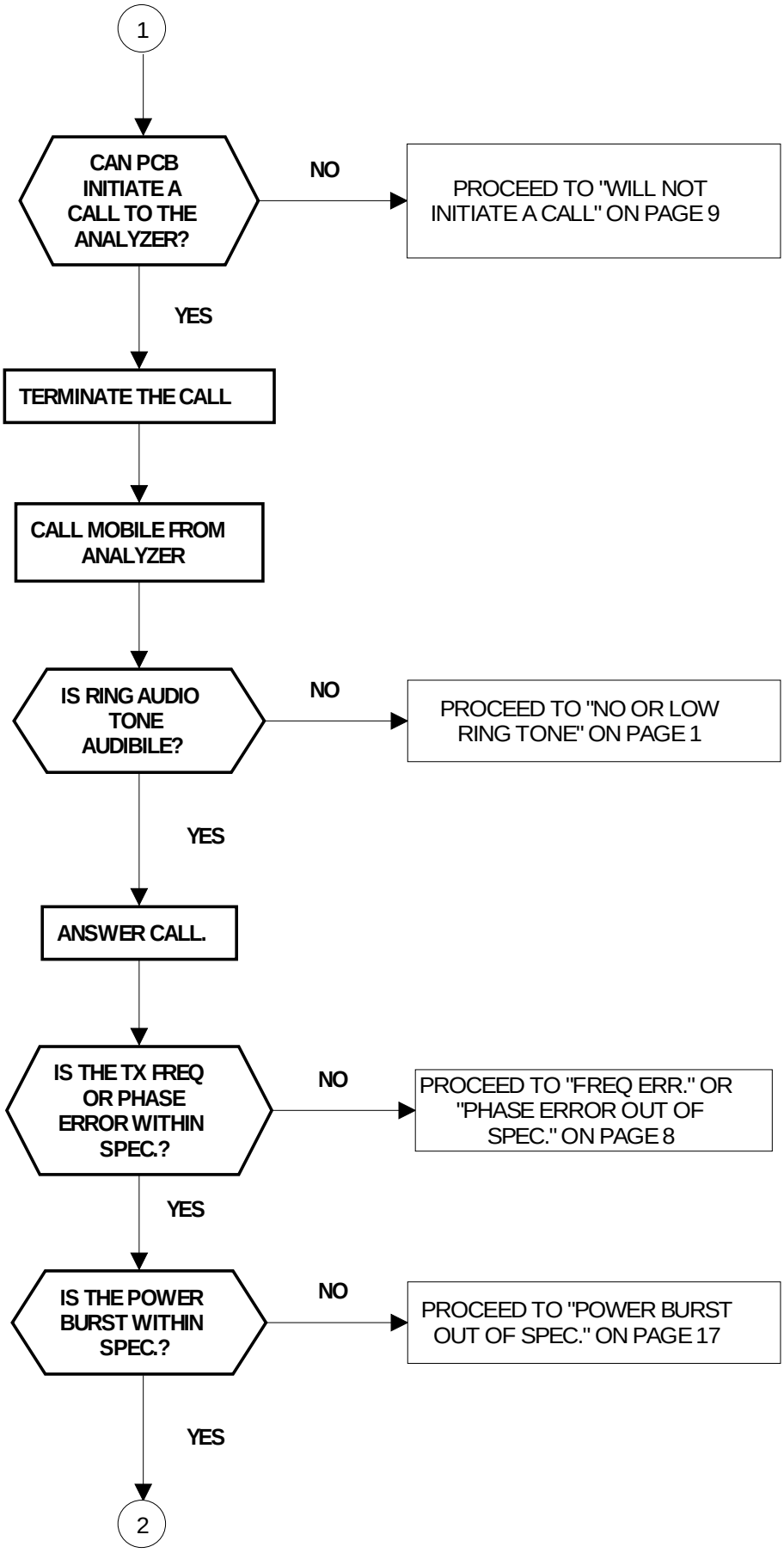
IF ANY MENTIONED PROBLEMS ARE PRESENT RETURN PCB TO HI-TECH.

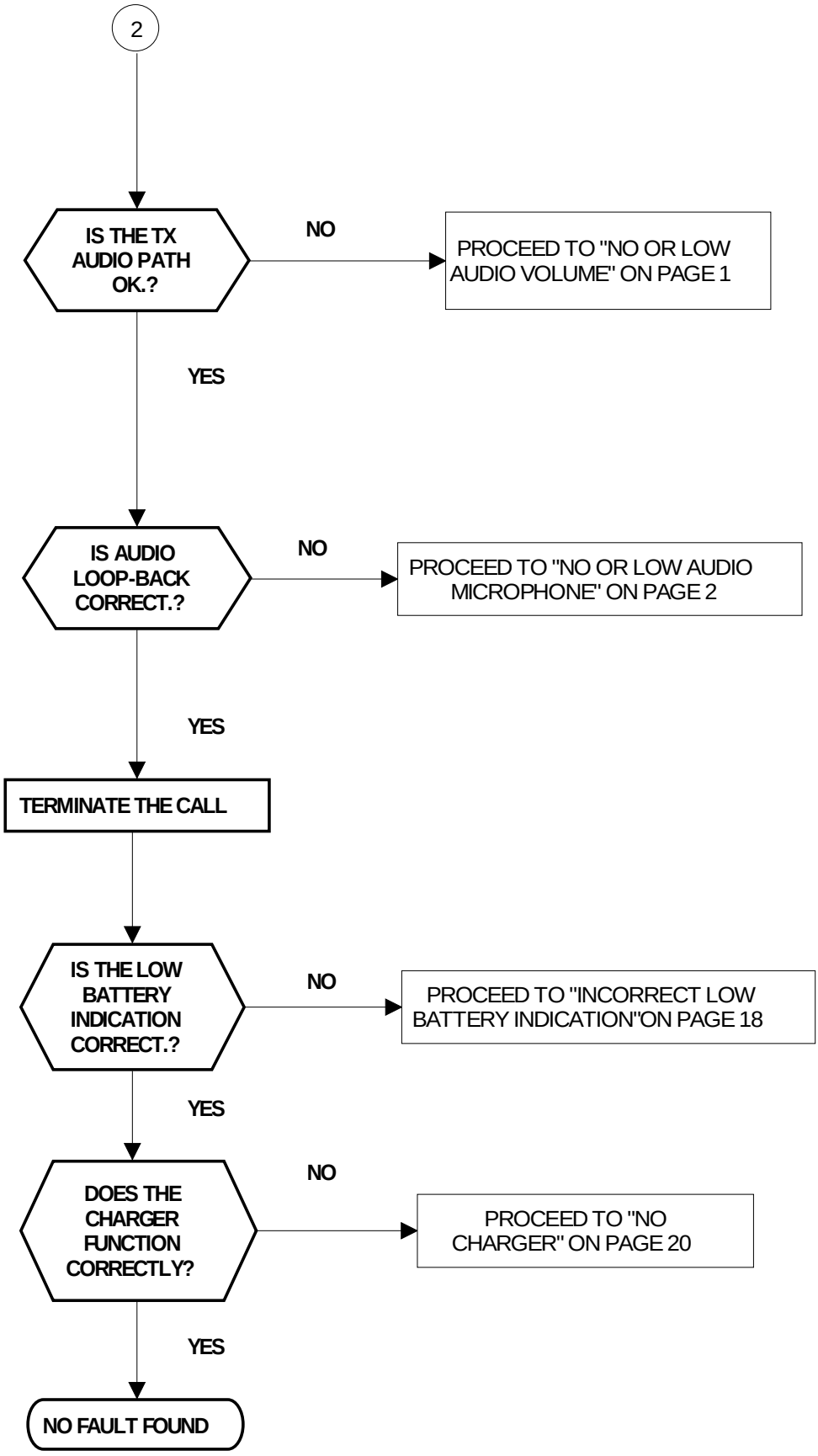
INCORRECT LOW BATTERY INDICATION

NO OR LOW DISPLAY



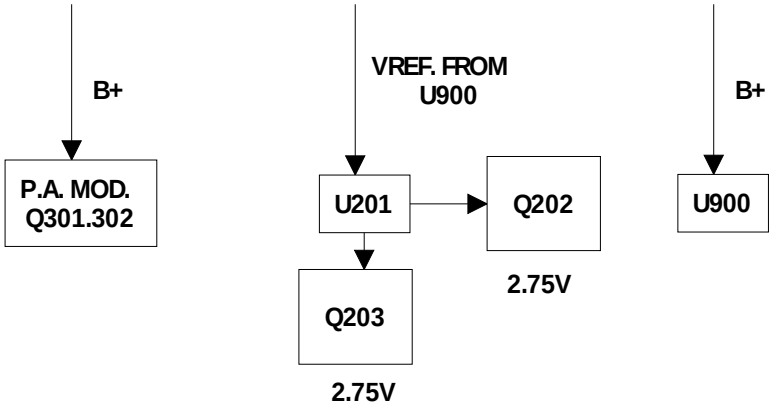

DOES PCB POWER UP CORRECTLY.?
NO
PROCEED TO "WILL NOT POWERS & STAY ON" ON PAGE 3
YES
DOES PCB DRAWS CURRENT WHEN IS OFF?
YES
PROCEED TO "DRAWS CURRENT WHEN IS OFF" ON PAGE 19
NO
DOES PCB POWER DOWN WHEN TWISTED?
YES
PROCEED TO "POWER OFF WHEN TWISTED" ON PAGE 8
NO
DOES WAKE UP DISPLAY CORRECT.?
NO
PROCEED TO "NO OR LOW DISPLAY" ON PAGE 18
YES
DOES DISPLAY SHOW "PHONE FAILURE SEE SUPPLIER"?
YES
PROCEED TO "PHONE FAILURE SEE SUPPLIER" ON PAGE 19
NO
DOES PCB GO INTO SERVICE AT -102dBm?
NO
PROCEED TO "NO SERVICE AT -102dBm" ON PAGE 12
YES
1


1
CAN PCB INITIATE A CALL TO THE ANALYZER?
NO
PROCEED TO "WILL NOT INITIATE A CALL" ON PAGE 9
YES
TERMINATE THE CALL
CALL MOBILE FROM ANALYZER
IS RING AUDIO TONE AUDIBILE?
NO
PROCEED TO "NO OR LOW RING TONE" ON PAGE 1
YES
ANSWER CALL.
IS THE TX FREQ OR PHASE ERROR WITHIN SPEC.?
NO
PROCEED TO "FREQ ERR." OR "PHASE ERROR OUT OF SPEC." ON PAGE 8
YES
IS THE POWER BURST WITHIN SPEC.?
NO
PROCEED TO "POWER BURST OUT OF SPEC." ON PAGE 17
YES
2

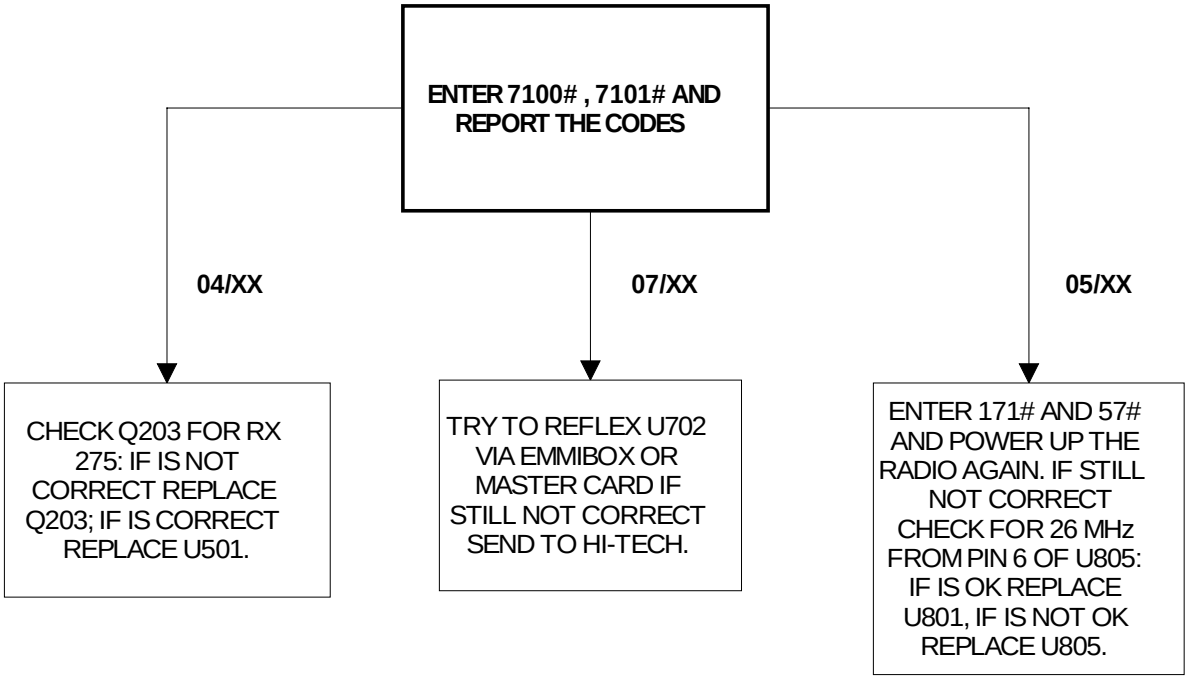

2
IS THE TX AUDIO PATH OK.?
NO
PROCEED TO "NO OR LOW AUDIO VOLUME" ON PAGE 1
YES
IS AUDIO LOOP-BACK CORRECT.?
NO
PROCEED TO "NO OR LOW AUDIO MICROPHONE" ON PAGE 2
YES
TERMINATE THE CALL
IS THE LOW BATTERY INDICATION CORRECT.?
NO
PROCEED TO "INCORRECT LOW BATTERY INDICATION"ON PAGE 18
YES
DOES THE CHARGER FUNCTION CORRECTLY?
NO
PROCEED TO "NO CHARGER" ON PAGE 20
YES
NO FAULT FOUND

PCB DRAWS CURRENT WHEN IS OFF

CHECK TRANSISTOR REGULATOR: Q202, Q203 AND U201 ARE NOT PHISCALLY DAMAGE; CHECK ALSO U900 TO MONITORING WHICH COMPONENT BECOMING WARMER AFTER REPLACE IT.

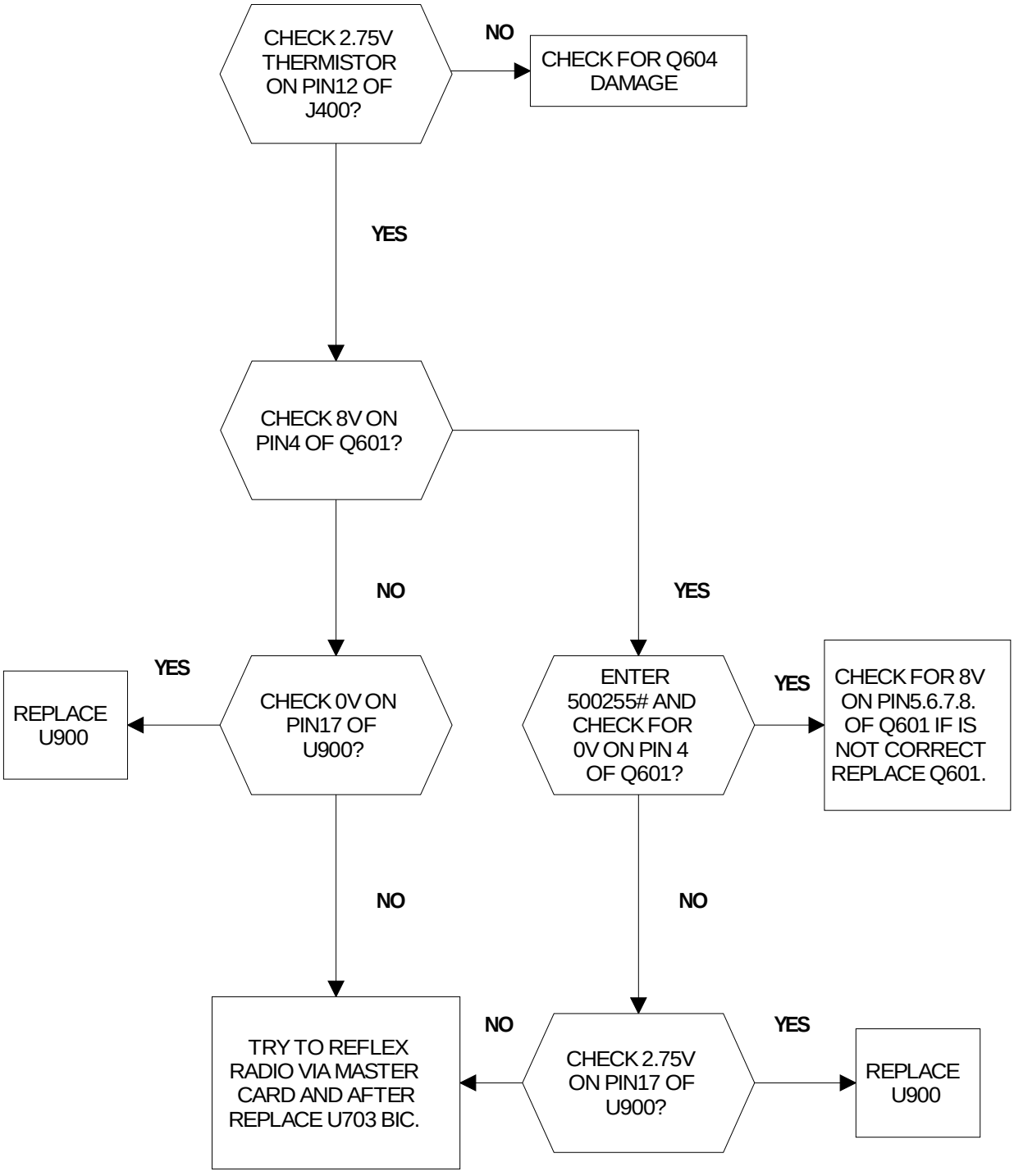


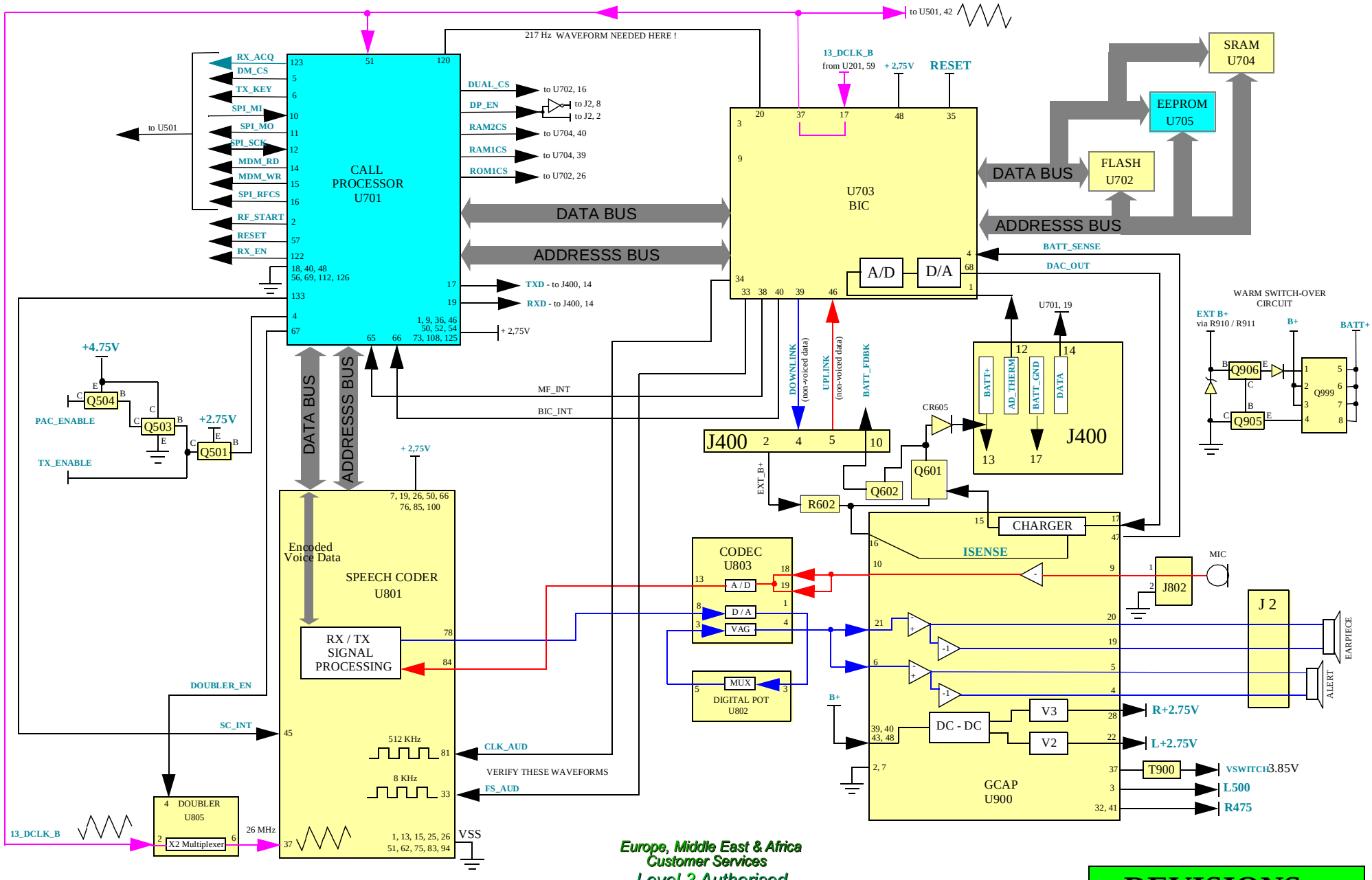
PHONE FAILED SEE SUPPLIER


ENTER 7100# , 7101# AND REPORT THE CODES
04/XX
07/XX
05/XX
CHECK Q203 FOR RX 275: IF IS NOT CORRECT REPLACE Q203; IF IS CORRECT REPLACE U501.
TRY TO REFLEX U702 VIA EMMIBOX OR MASTER CARD IF STILL NOT CORRECT SEND TO HI-TECH.
ENTER 171# AND 57# AND POWER UP THE RADIO AGAIN. IF STILL NOT CORRECT CHECK FOR 26 MHz FROM PIN 6 OF U805: IF IS OK REPLACE U801, IF IS NOT OK REPLACE U805.

NO CHARGER

TEST CONDICTION: RADIO SUPPLY FROM EXT B+ AND IN TEST-MODE

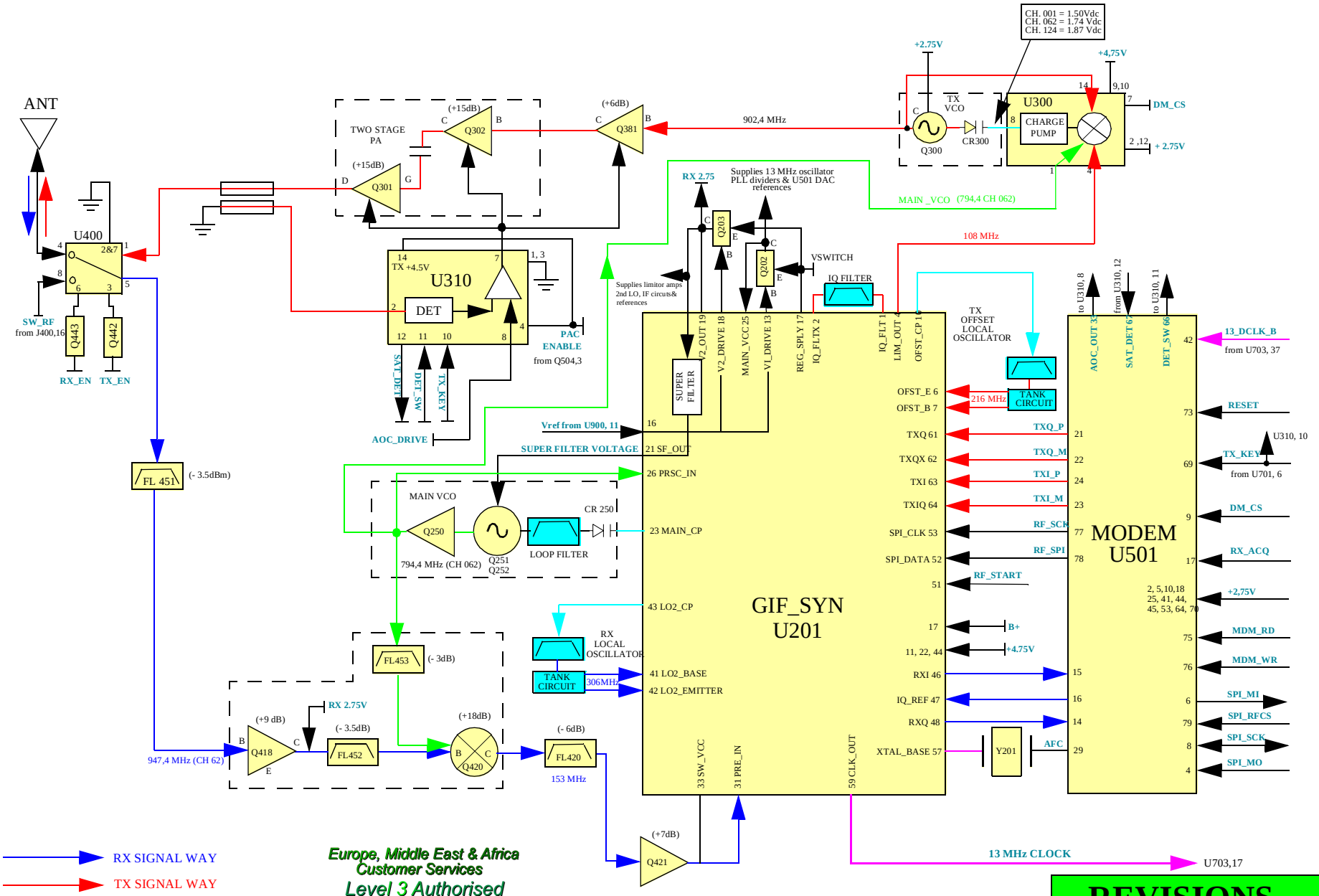

CHECK 2.75V THERMISTOR ON PIN12 OF J400?
NO
CHECK FOR Q604 DAMAGE
YES
CHECK 8V ON PIN4 OF Q601?
NO
YES
CHECK 0V ON PIN17 OF U900?
YES
REPLACE U900
ENTER 500255# AND CHECK FOR 0V ON PIN 4 OF Q601?
YES
CHECK FOR 8V ON PIN5.6.7.8. OF Q601 IF IS NOT CORRECT REPLACE Q601.
NO
NO
TRY TO REFLEX RADIO VIA MASTER CARD AND AFTER REPLACE U703 BIC.
NO
CHECK 2.75V ON PIN17 OF U900?
YES
REPLACE U900



GSM 6700 / 8700: AL BLOCK DIAGRAM

REVISIONS

Europe Middle East & Africa Customer Services	20.03.98
LEVEL 3 COLOUR DIAGRAMS	Rev. 1.0
Dual Band ZAP	
Colin Jack, Michael Hansen, Billy Jenkins	Page 1 of 2



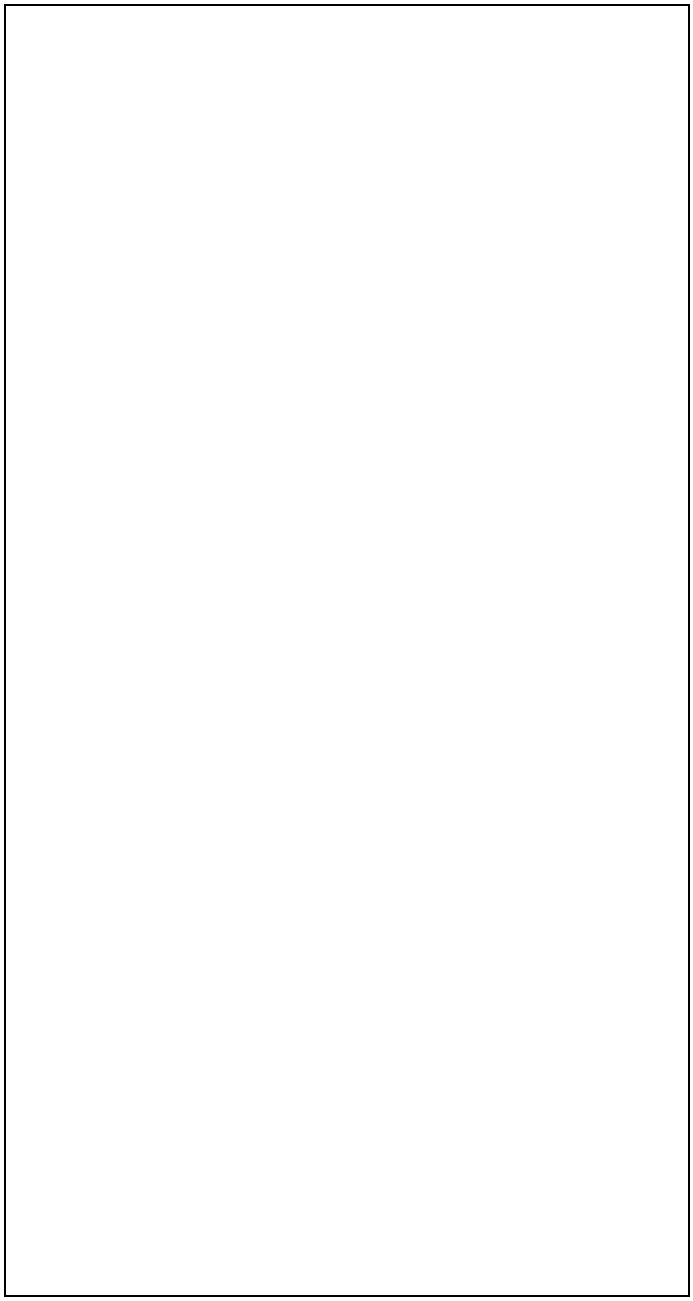
Europe, Middle East & Africa
Customer Services
Level 3 Authorised

GSM 6700 / 8700: RF BLOCK DIAGRAM

REVISIONS

Europe Middle East & Africa Customer Services	20.03.98
LEVEL 3 COLOUR DIAGRAMS	Rev. 1.0
Dual Band ZAP	
Colin Jack, Michael Hansen, Billy Jenkins	Page 1 of 2

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE



Module Level
Repair Manual
68P09304A68-O

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PERFORMANCE SPECIFICATIONS -INTERNATIONAL 8700 (GSM)

GENERAL

Frequency Range	890-915 MHz Tx 935-960 MHz Rx
Channel Spacing	200 kHz
Number of Channels	124 carriers with 8 channels per carrier
Modulation	GMSK at BT = 0.3
Transmitter Phase Accuracy	5 Degrees RMS, 20 Degrees peak
Duplex Spacing	45 MHz
Frequency Stability	+/- 0.10 ppm of the downlink frequency (Rx)
Voltage Operation	+5.7 to +8.5V dc
Transmit Current	<199 mA average, 900mA peak
Stand-by Current	Average 10 mA (DRX 2)
Dimensions	131 mm (L) x 59 mm(W) x 24 mm(D) (5.2” x 2.3” x 0.9”)
Size (Volume)	173 cubic cm (10.6 cubic in)
Weight	Approximately 210g; Includes GP4 MiMH battery pack and antenna
Temperature Range	-20°C to +55°×C

TRANSMITTER

RF Power Output	33 dBm
Output Impedance	50 ohms (nominal)
Spurious Emissions	-36 dBm up to 1 GHz, (<-30 dBm > 1 GHz)

RECEIVER

RF Level	-102 dBm
RX bit error rate (100 kbits)	< 2%
Channel Hop Time	500 microseconds
Time to Camp	Approximately 10 seconds

SPEECH CODING

Speech Coding Type	Regular Pulse Excitation / Linear Predictive Coding with Long Term Prediction. (RPE LPC with LTP.
Bit Rate	13.0 kbps
Frame Duration	20 ms
Block Length	260 bits
Classes	Class 1 bits = 182 bits. Class 2 bits = 78 bits
Bit Rate with FEC Encoding	22.8 kbps

Specifications subject to change without notice

CAUTION

Do not jump start vehicle or use an automotive battery charger while the vehicle adapter option and the portable radiotelephone are connected to the vehicle electrical system as this may cause serious damage to the radio. Disconnect the radio by removing the cable kit fuses.

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CHANGE RECORD

CHANGE	DATE	SIGNATURE	DATE OF COMPLETION	NOTES (Section Affected)
O-Original	1/6/96	-	1/6/96	

When CMR's are issued against this manual they are to be inserted in numerical order, then this record sheet should be annotated to confirm the action. If there are any subsequent problems resulting then the 'Documentation Feedback' form should be completed and returned to address given. See section in this manual.

Motorola reserves the right to make changes in technical and product specifications without prior notice

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INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE
CONTENTS LIST

SECTION 1 - GENERAL — **PAGE NUMBER**

FOREWORD xi
MOTOROLA SERVICE POLICY xi
GENERAL SAFETY INFORMATION xii
EXPRESS EXCHANGE PROGRAM 1
- INTRODUCTION 1
- EQUIPMENT REQUIRED 1
- EXCHANGE PROCEDURE 1

SECTION 2 - DESCRIPTION

SYSTEM DESCRIPTION 3
- G.S.M. SYSTEM OVERVIEW 3
- TELEPHONE DESCRIPTION 6

FEATURE LIST 9

SECTION 3 - LABELLING & SIM CARDS

TRANSCEIVER LABELLING 11
- INTRODUCTION 11
- TITLE EXPLANATIONS 11

SIM CARDS 13
- INTRODUCTION 13
- SIM CARD INSERTION/REMOVAL 13
- SECURITY INFORMATION 13

SECTION 4 - MANUAL - TEST MODE & VERIFICATION

MANUAL-TEST MODE 15
- INTRODUCTION 15
- TEST SIM INSERTION/REMOVAL 15
- ACCESSING THE MANUAL-TEST MODE 15

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SECTION 4 - MANUAL - TEST MODE & VERIFICATION (cont) **PAGE NUMBER**

VERIFICATION 17
INTRODUCTION 17
EQUIPMENT CONFIGURATION 17
TESTING PROCEDURE 18

SECTION 5 - TROUBLESHOOTING

TROUBLESHOOTING 19
INTRODUCTION 19
TROUBLESHOOTING AND REPAIR 19
TESTING AFTER REPAIR 19
TROUBLESHOOTING AND REPAIR CHART 20

SECTION 6 - PERSONALITY TRANSFER

PERSONALITY TRANSFER 23
INTRODUCTION 23
NORMAL TRANSFER 23
MASTER TRANSFER 24
MASTER SIM CARD CREATION 24

SECTION 7 - DISASSEMBLY

DISASSEMBLY INSTRUCTIONS 25
INTRODUCTION 25
RECOMMENDED TOOLS 25
DISASSEMBLY PROCEDURE 25
ASSEMBLY PROCEDURE 25
EXPLODED DIAGRAM AND PART NUMBERS 35

SECTION 8 - ACCESSORIES

RECHARGEABLE BATTERY PACKS 37
INTRODUCTION 37
RECHARGING 37
EXPERT PERFORMANCE BATTERIES AND CHARGERS 38
BUILT IN E.P BATTERY FAST CHARGER 38

SSECTION 8 - ACCESSORIES (cont)	**PAGE NUMBER**
NICAD BATTERY PACKS	39
NI-MH BATTERY PACKS	41
LITHIUM ION BATTERY PACKS	43
TRAVEL BATTERY CHARGER	45
CIGARETTE LIGHTER ADAPTOR/CHARGER	47
INTELLICHARGE E.P BATTERY CHARGER	49
CAR KITS	53
INTRODUCTION	53
STANDARD DHFA	53
MICRO CAR KITS	53
HANDSFREE CAR KIT	53
INSTALLATION	53
SECTION 9 - GLOSSARY	
GLOSSARY OF GSM TERMS	55
SECTION 10 - NOTES	
FEED BACK FORM	57
NOTES	59

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Cellular Subscriber Group

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE
MODULE LEVEL REPAIR MANUAL

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TYPICAL MODEL COMPLEMENT FOR INTERNATIONAL 8700 2.0 WATT - S5634AAx

Model	Description	Quantity Supplied
SUF3839A	Transceiver	1
SNN4612 SNN4458	Slim NiMH Battery XT Li-Ion Battery	1
SPN4222A or SPN4221A	Euro or UK Transformer	1
SJN6549A - SJN6555A	User Manual	1

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Major changes which occur after the printing date are incorporated by Cellular Manual Revisions (CMR). These CMR's are added to the manuals as the engineering change is incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

MOTOROLA SERVICE POLICY (8700)

In most countries Motorola will operate an Express Exchange Program for the 8700 personal cellular telephone. Authorized Express Exchange Centres will exchange a customer's defective unit for a refurbished unit (if the defective unit is covered by warranty, and has not been damaged or opened by the customer). The Express Exchange Centre must write the mechanical serial number of the customer's original unit on the warranty label of the exchange unit's housing. This ensures that when a customer returns a unit, the Express Exchange Centre can verify whether a customer is entitled to warranty. Motorola National Support Centres will log and track units by the typed mechanical serial number on the approval label, which will always remain on the phone.

Motorola National Support Centres may also act as Express Exchange Centres, and hold a quantity of exchange units. This pool of exchange units may be used for "quick turnaround" emergency support to Express Exchange Centres which have become short of replacement units.

The defective units will be returned initially to the National Support Centres, HUB's, or their nominated and approved Cellular Service Centres. Service Centres will be responsible for performing level 2 repairs. If it is found that the problem is localised to the PCB then, in the case of an approved Cellular Service Centre, the unit will be sent to a National Support Centre or HUB.

Product Service training should be arranged through the local Motorola National Support Centre.

REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

Only centres authorized by Motorola to carry out repairs will be able to purchase spare parts. Orders for spare parts from HUB's, Motorola National Support Centres and Hi-Tech Centres, should be placed with the appropriate Motorola Parts Distribution Centre.

BOARD REPAIRS

All centres authorized to carry out module level repairs, must return faulty boards to the appropriate HUB or Motorola Hi-Tech Centre for repair to component level.

GENERAL SAFETY INFORMATION

PORTABLE OPERATION:

DO NOT hold the radio so that the aerial is very close to, or touching, exposed parts of the body, especially the face or eyes whilst transmitting. The radio will perform best if it is held in the same manner as you would hold a 'land' telephone handset, with the aerial angled up and over your shoulder.

DO NOT operate the portable phone in an aircraft. Switch off your telephone. The use of a cellular telephone in an aircraft may be dangerous to the operation of the aircraft, disrupt the Cellular Network, and is illegal. Failure to observe this instruction may lead to a suspension or denial of Cellular Telephone Service to the offender, or legal action, or both.

MOBILE/PORTABLE OPERATION - Telephone use in Vehicles:

All equipment must be properly grounded according to installation instructions for safe operation.

Users are advised to turn off their equipment when at a refuelling point.

Safety is every drivers business. Cellular telephones should only be used in situations in which the driver considers it safe to do so.

GENERAL:

DO NOT allow children to play with any radio equipment containing a transmitter.

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are, under certain conditions, capable of interfering with blasting operations. When you are in the vicinity of such work, look out for and observe signs cautioning against mobile radio transmission. If transmission is prohibited, **you must turn off** your mobile telephone **to prevent any transmission**.

In standby mode the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.

Refer to the appropriate section of the product user manual for additional pertinent safety information

All equipment should be serviced only by a qualified technician.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE EXPRESS EXCHANGE™ PROGRAM

EXPRESS EXCHANGE

1. INTRODUCTION

The basis of Motorola's Express Exchange™ program is that when a customer's unit becomes defective, its programming information is transferred into a fully functional exchange phone. The exchange phone is then given to the customer, allowing the customer to continue using the same type of cellular telephone, without having to worry about the length of the repair process.

2. EQUIPMENT REQUIRED

The following items are required for the exchange process to be possible:-

- Exchange cellular telephone (same as customer's unless multi bezel phones are being supported).
- Charged battery pack.
- Full size transfer SIM card.
- Full size master transfer SIM card.

3. EXCHANGE PROCEDURE

The following steps must be carried out when exchanging a defective International 8700 personal cellular telephone (if covered by warranty) for a fully functional exchange unit.

Step 1. Select an exchange unit, which should be the same model as the defective unit.

Step 2. Transfer the personality of the customer's defective telephone into the exchange unit. See page 21 of this manual for further details.

Step 3. When the personality transfer has been completed successfully, insert the customer's SIM card into the exchange unit. See page 11, for further details on SIM card insertion.

Step 4. With the SIM card in place, power up the exchange telephone. Place a call to confirm that the unit is functioning correctly.

Step 5. Write the mechanical serial number of the customers original unit on the warranty label of the exchange unit, positioned above the type approval label on the rear housing. Then give the exchange phone to the customer.

Step 6. Return the defective unit to the nearest Motorola HUB or Authorized Repair Centre for repair. Note that full component level repair is carried out at Motorola Hi Tech Centres only.

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SYSTEM DESCRIPTION

1. G.S.M. SYSTEM OVERVIEW

NOTE

The following description is intended only as a preliminary general introduction to the **Global System for Mobile communications (G.S.M.)** cellular network. This description is greatly simplified and does not illustrate the full operating capabilities, techniques, or technology

1.1 GENERAL CELLULAR CONCEPT

The cellular systems are used to provide radiotelephone service in the frequency range 890-960 MHz. A cellular system provides higher call handling capacity and system availability than would be possible with conventional radiotelephone systems (those which require total system area coverage on every operating channel) by dividing the system coverage area into several adjoining sub-areas or cells.

Each cell contains a base station (cell site) which provides transmitting and receiving facilities, for an allocated set of duplex frequency pairs (channels). Since each cell is a relatively small area, both the cell site and the radiotelephone that it supports can operate at lower power levels than would be used in conventional systems. Using this technique, radiation on a given channel is virtually contained in the cell operating on that channel and, to some extent, those cells directly adjacent to that cell.

Since the coverage area of a cell on a given channel is limited to a small area (relative to the total system coverage area), a channel may be reused in another cell outside the coverage area of the first. By this means, several subscribers may operate within the same geographic area, without interference with each other, on a single channel.

1.2 G.S.M. DESCRIPTION

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Refer to Figure 1. In the figure, the area bounded by bold lines represents the total coverage area of a hypothetical system. This area is divided into several cells, each containing a cell site (base station) operating on a given set of channels which interfaces radiotelephone subscribers to the telephone switching system.

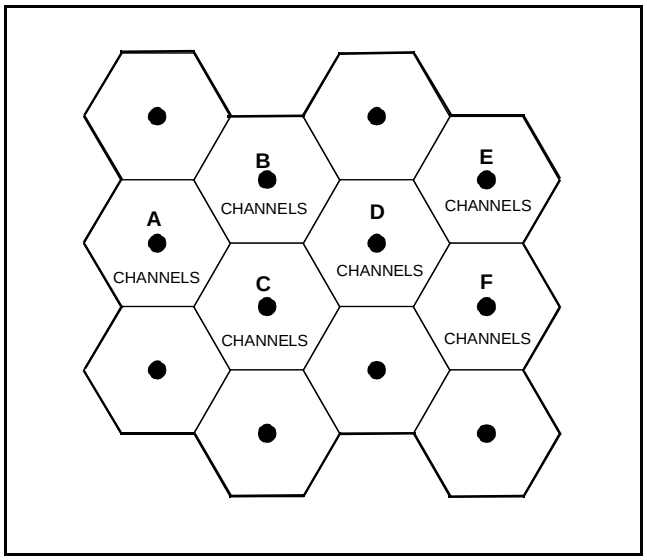

Figure 1. Hypothetical Cell System

The radiotelephones themselves are capable of operation on any channel in the system, allowing them to operate in any cell. Due to the low power requirements for communications between radiotelephones in a particular cell and the cell site, operating channels may be repeated in cells which are outside the coverage area of each other.

For example, presume that cell A operates on channels arbitrarily numbered 1 through 8, cell B operates on channels 9 through 16, cell C operates on channels 17 through 24 and cell D operates on channels 1 through 8 (repeating the usage of those channels used by cell A). In this system, subscribers in cell A and subscribers in cell D could simultaneously operate on channels 1 through 8. The implementation of frequency re-use increases the call handling capability of the system, without increasing the number of available channels. When re-using identical frequencies in a small area, co-channel interference can be a problem. The G.S.M. system can tolerate higher levels of co-channel interference than analogue systems, by incorporating digital modulation, forward error correction and equalization. This means that cells using identical frequencies can be physically closer, than similar cells in analogue systems. Therefore the advantage of frequency re-use can be further enhanced in a G.S.M. system, allowing greater traffic handling in high use areas.

By incorporating Time Division Multiple Access (TDMA) several calls can share the same carrier. The carrier is divided into a continuous stream of TDMA frames, each frame is split into eight time slots. When a connection is required the system allocates the subscriber a dedicated time slot within each TDMA frame. User data (speech/data) for transmission is digitized and sectioned into blocks. The user data blocks are sent as information bursts in the allocated time slot of each TDMA frame, see Figure 2. The data blocks are modulated onto the carrier using Gaussian Minimum Shift Keying (GMSK), a very efficient method of phase modulation.

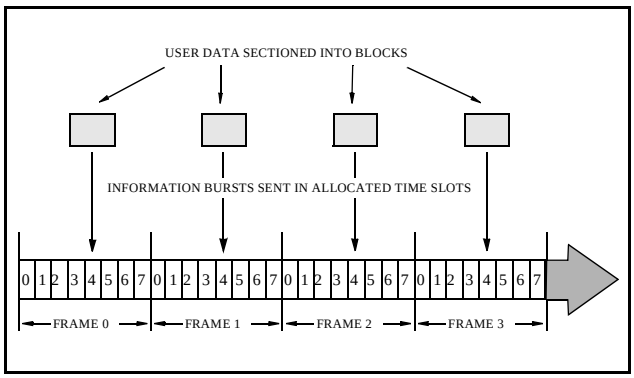
USER DATA SECTIONED INTO BLOCKS
INFORMATION BURSTS SENT IN ALLOCATED TIME SLOTS
0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
FRAME 0
FRAME 1
FRAME 2
FRAME 3

Figure 2. Time Division Multiple Access Transmission

Each time an information burst is transmitted, it may be transmitted on a different frequency. This process is known as frequency hopping. Frequency hopping reduces the effects of fading, and enhances the security and confidentiality of the link. A G.S.M. radiotelephone is only required to transmit for one burst in each frame, and not continually, thus enabling the unit to be more power efficient.

Each radiotelephone must be able to move from one cell to another, with minimal inconvenience to the user. The mobile itself carries out signal strength measurements on adjacent cells, and the quality of the traffic channel is measured by both the mobile and the base station. The handover criteria can thus be much more accurately determined, and the handover made before the channel quality deteriorates to the point that the subscriber notices.

When a radiotelephone is well within a cell, the signal strength measured will be high. As the radiotelephone moves towards the edge of the cell, the signal strength and quality measurement decreases. Signal information provides an indication of the subscriber's distance from the base station. As the radiotelephone moves from cell to cell, its control is handed from one base station to another in the new cell. This change is handled by the radiotelephone and base stations, and is completely transparent to the user.

1.3 SERVICE AREA

The area within which calls can be placed and received is defined by the system operators. (Because this is a radio system, there is no exact boundary that can be drawn on a map.) If the telephone is outside a coverage area, the ∅ (no service) indicator will illuminate and calls will be unable to be placed or received. If this happens during a conversation, the call will be lost. There may also be small areas within a particular service area where communications may be lost.

The radiotelephone's identity information is held by its local G.S.M. system in its Home Location Register (HLR) and Visitor Location Register (VLR). The VLR contains identity information on all local active radiotelephones. Should you roam to another area, system or country the radiotelephones identity information is sent to the VLR in the new system. The new system will then check the radiotelephones details with your home system for authenticity. If everything is in order it will be possible to initiate and receive calls whilst in the new area.

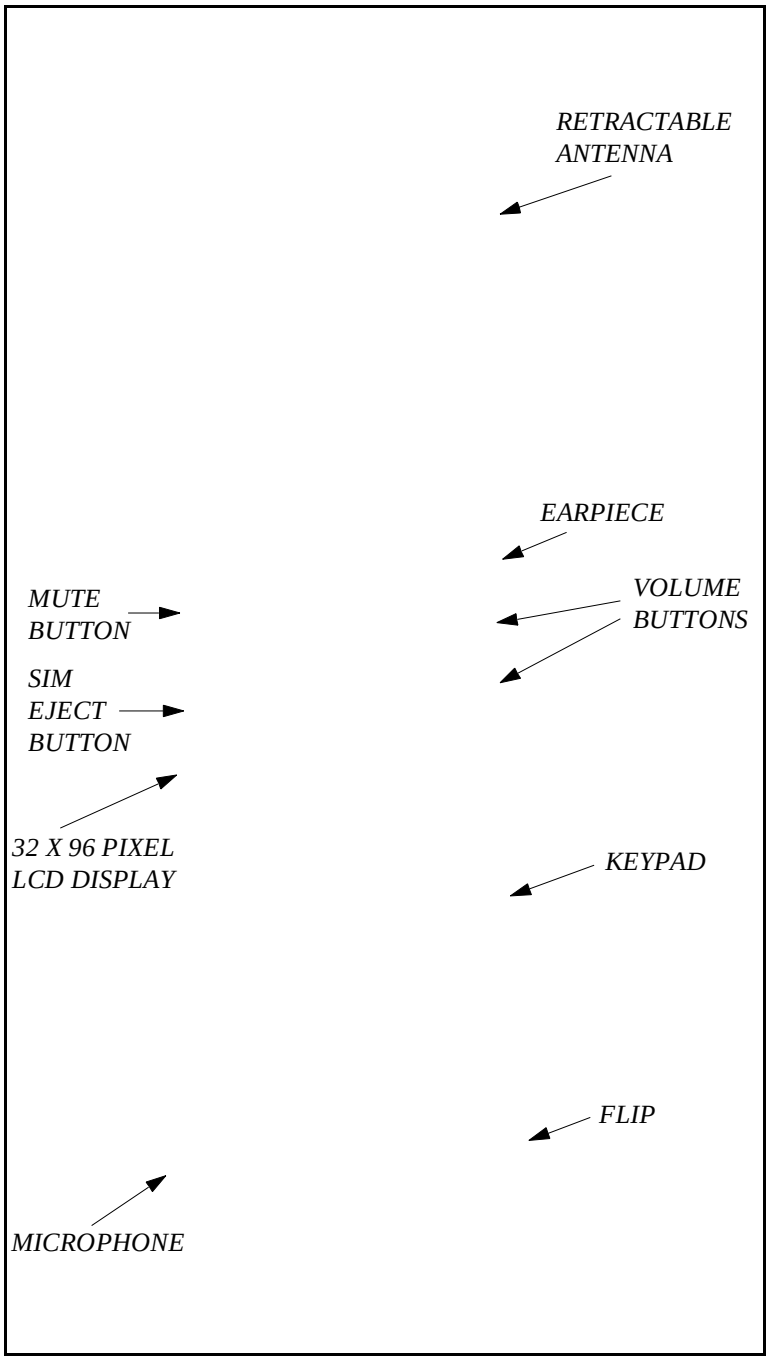

Figure 3. International 8700 Personal Cellular Telephone.

2. CELLULAR PERSONAL TELEPHONE DESCRIPTION

2.1 GENERAL

The International 8700 personal cellular telephone (shown on previous page, in Figure 3) is a microprocessor controlled, full duplex, synthesized FM radiotelephone using digital modulation techniques, for use in compatible 900 MHz cellular radiotelephone systems. When operated properly, the equipment will provide the user with land-linked telephone service through individual cell site base stations, all linked to a central control office. The International 8700 has a 2.0 Watt maximum output power capability.

2.2 PHYSICAL PACKAGING

The transceiver circuitry is contained in a water resistant polycarbonate plastic housing measuring (including Slim battery pack) 131 mm (L) x 59 mm (W) x 24 mm (D) (5.2" x 2.3" x 0.9"). It weighs approximately 214g; includes Slim NiMH battery pack and antenna.

The main internal electronic circuitry is contained on two multi-layer boards. The keypad board assembly incorporates the display, keypad contacts and mylar switches, alert transducer, vibrator and earpiece speaker. The display is glued to the board by a foam gasket with electrical connections via a short flex strip. Also on the keypad board are the contacts for the SIM card, the mute and volume button contacts, the SIM card presence switch, and the magnetic reed switch.

The RF/Logic board is divided into two sections. The top half of the board (antenna end), has the RF circuitry located on both sides of the board. Similarly, the Audio/Logic circuitry is located on both sides of the lower half of the board (accessory connector end). Electrical connections between the two sides of the board are provided by feed-through connectors at various points on the board. Also on the main board are the accessory connector, the battery contacts and the microphone plug socket. The microphone and grommet sits in a small pocket in the front housing and connects to the main board via two wires terminated in a plug.

The accessory connector, situated at the base of the phone on the main board, allows connections to the audio/logic circuitry and antenna for accessory applications such as a mobile adaptor and chargers. When the accessory RF connector is used (ie terminated with a resistance of approximately 10 Kohms or less to ground) the RF to the top antenna is disconnected.

Grounding shields on the main board provide electrical isolation and protection to the RF circuits. Interconnection between the two main boards takes place via a 41 pin female connector situated on the display board, and a corresponding male connector on the main board.

Operating power for the personal telephone can be obtained from various methods including the following:-

1/. The Super Slim Battery Lithium (SNN4383).

This rechargeable Lithium Ion battery pack is the lightest Motorola battery offered for the International 8700.

2/. The Super Slim Battery NiCad (SNN4467).

3/. The Ultra Slim Battery NiCad (SNN4132).

4/. The Ultra Slim Battery NiMH (SNN4283).

5/. The Slim XT Battery NiCad (SNN4102).

6/. The Standard Battery NiCad (SNN4027).

7/. The Standard XT Battery NiMH (SNN4259).

8/. The Cigarette Lighter Adaptor (SLN9933).

The battery charger plugs into the accessory connector socket, situated at the base of the telephone, and a vehicle's cigar lighter socket. As well as providing a battery charging function, the adaptor provides power directly to the phone whilst it is in use even with a 'dead' battery.

9/. Vehicle Adaptor Kits.

There are various vehicle adaptor kits available. They all provide power to the unit from the vehicle's own electrical system, via the accessory connector socket (located at the base of the phone). All the kits offer battery charging as standard.

10/. Travel Battery Charger

This is a mains adaptor which plugs directly into the phone. It charges the phone's battery whilst attached and also provides dead battery operation.

NOTE: The *International 8700* may have various battery options as standard depending on the particular market requirements.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE
PRODUCT DESCRIPTION
FEATURE LIST

FEATURE LIST	PRESENT
VISUAL/AUDIO FEATURES	
Display	32 X 96 Pixel Graphics Display
Number Capacity (per location)	20
Name Capacity (per location)	16
Language Selection	14
Automatic Language Selection based on SIM	X
Silence Ringer w/Visual	X
Silence Keypad Tones	X
Adjustable earpiece volume	X
Adjustable ringer volume	X
Silence Scratchpad	X
Call in Absence Indicator	X
Display Signal Strength - continuous	X
Display Battery Level - continuous	X
Audible Low Battery Warning	X
Status Review	X
Microphone Mute	X
Illuminated Display	X
Backlight Display	X
Dedicated Control Keys	7
User Definable Wake Up Test	X
CALL PLACEMENT FEATURES	
VibraCall Alert	X
Selectable Ringer Tones	X
Selectable Keypad Tones	X
Short, Extended and Personalised Menu List	X
Auto Redial	X
Clear Last Digit/All	X
Mute Control	X
International Access Key Sequence	X
User Call Rejection	X
Pre-origination Dialling	X

FEATURE LIST	PRESENT
Memories:	
Numbered	100
SIM Card - Dependent on SIM	X
Last 10 Numbers Dialed	X
Last 10 Numbers Received (if using CLI)	X
Notepad (Last Number Entered)	X
Turbo Dialling (9 Numbers 1 Touch Dial) from Phone and SIM	X
Alpha Name Storage	X
Recall by Name or Location	X
Memory Linking/Pause	X
Memory Auto Load	X
Memory Scroll	X
Alpha Name Scrolling	X
Memory Capacity	X
DTMF Signalling:	
Long Tone DTMF	X
DTMF from Memory	X
Postscripting	X
Menu Operation	X
Silent Alert	X
Call Diverting/Barring (Via the Menu)	X
Calling Line Identification (Present and Restrict)	X
Call Waiting	X
Call Hold	X
Master Clear	X
Master Reset	X
DTX (Discontinuous Transmission)	X
112 Emergency Call Origination	X
COST CONTROL FEATURES	
Electronic Lock	X
Automatic Lock	X
Programmable Unlock Code	X
Display Unlock Code	X

An 'X' indicates that the feature is present in the International 8700

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FEATURE LIST	PRESENT
COST CONTROL FEATURES (cont.)	
Display Call Timers and/or Charge Meters:	
Last Call	X
Total	X
Home	X
Roam	X
Programmable Audible Call Timer	
One Time	X
Repeatable (User Defined)	X
Automatic Timer Display:	
Charge (units/currency)	X
Minutes	X
Store Charge Rate:	
Home Rate	X
Roam Rate	X
Call Restriction Levels:	
Restrict Keypad Dialing	X
Variable Memory Recall Restriction	X
Restrict Incoming Calls	X
Restrict Phone Number Length (Vari)	X
Full Service-No Restrictions	X
PIN Entry	X
PIN Enable/Disable	X
PIN Change	X
PIN Unblocking	X
NETWORK RELATED	
Service Selection:	
Auto PLMN Selection	X
PLMN Select from Scan List	X
Scan List Display (auto and manual)	X
Change Preferred List	X
Rearrange Order of Preferred List	X
Full Size SIM card	X
Display Own Phone Number	X
MESSAGING AND DATA	
SMS:	
Mobile Originated	X
Create/send/store/edit/view/delete	X
Mobile Terminated Point to Point	X
Cell Broadcast	X
Data Calls	X
VEHICULAR FEATURES	
On Hook Call Processing	X
Volume Adj-Speaker	X
Safety Timer	X
Full Duplex Hands Free Operation	X
Ignition Sense (Auto Turn On)	X
Entertainment Mute	X
Auto Answer	X
OTHER FEATURES	
Status Indicators	X
Easy Battery Removal	X
Internal Charger	X
Dead Battery Operation with Chargers	X
Rapid Charger	X
Cigarette Lighter Charger (Option)	X

An 'X' indicates that the feature is present in the International 8700

TRANSCEIVER LABELLING

1. INTRODUCTION

Each Motorola GSM transceiver will be labelled with various number configurations. The following information shows and explains the common labelling titles.

2. TITLE EXPLANATIONS

2.1 MSN

The Mechanical Serial Number (MSN) is an individual number, uniquely identifying the unit. The MSN will remain the same throughout the units life, even if the main board is replaced. Because the MSN is unique to the whole phone, it is often used for logging and tracking purposes by Motorola National Service Centres on EPPRS. The MSN is divided into the sections shown in Figure1.

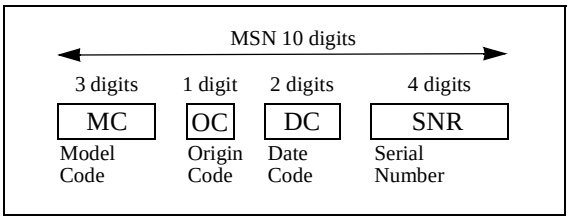

Figure 1. MSN Configuration

2.2 CEPT GSM

This is the International Mobile Station Equipment Identity (IMEI) number. The IMEI is held in the logic circuitry.

If the main board is replaced then the units IMEI will change, therefore the units labelling should be updated with the new IMEI. An IMEI uniquely identifies a mobile station equipment to the system, and is divided into the sections shown in Figure 2.

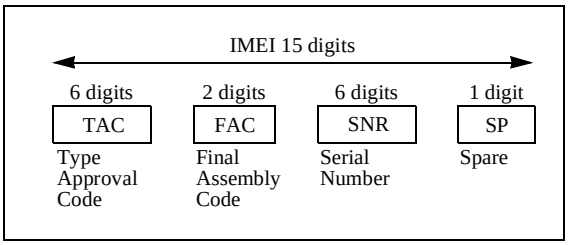

Figure 2. IMEI Configuration

2.3 REV S/H

This configuration consists of two blocks of two digits, and denotes the software and hardware versions within the unit. The first two digits correspond to the software version, and the last two digits correspond to the hardware version. If a version update is carried out on the unit, the corresponding change information should be made apparent on the labelling.

2.4 MODEL

The model number defines the type of product. Each product type is issued a common model number.

2.5 PACKAGE

The package number is used to determine the type of equipment, the mode in which it was sold, and the language with which it was shipped.

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SIM CARDS

1. INTRODUCTION

The Motorola International 8700 personal cellular telephones are designed to work with the full size Subscriber Identity Module (SIM). The SIM card contains all the personal data required to access GSM services. Data held by the SIM card includes:-

- International Mobile Subscriber Identity
- Temporary Mobile Subscriber Identity
- Home system
- Services subscribed to
- PIN and unblocking codes
- Call barring codes

The SIM card may also be capable of storing phone numbers, names, and messages.

2. SIM CARD INSERTION/REMOVAL

The SIM card must be inserted into the unit correctly so that the card can be read, and the data checked for validity, before operation on the system will be enabled. The card contains all of the user's personal identification numbers and details of the system the phone operates on.

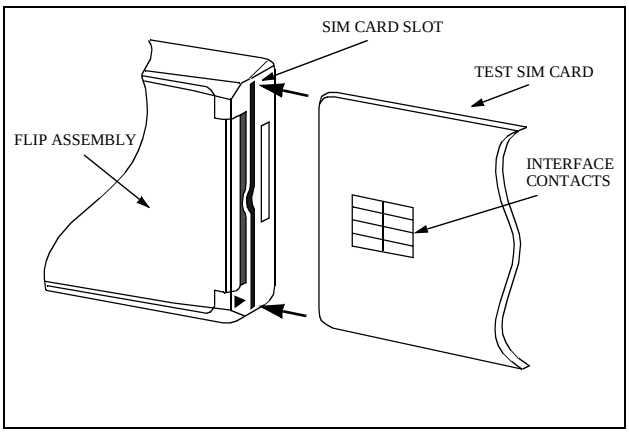

Figure 1. Inserting the Test SIM card

The whole SIM card should slide completely and securely into the slot at the base of the phone. Ensure that the contacts of the card face towards the front of the phone i.e. towards the flip.

The sliding, card release button will move upwards as the SIM card is inserted. When the button reaches the top of its recess and the card is flush with the base of the phone, it is inserted correctly. To remove the SIM card from the unit, push the sliding SIM card release button downwards. The card will then be pushed out far enough to allow complete removal. The User Guide contains full information about inserting and removing the SIM card.

3. SECURITY INFORMATION

To stop unauthorized personnel using your SIM card, the option of using a Personal Identity Number (PIN) is available. When enabled the option requires (on power up) a verification number to be entered via the unit's keypad, before the card can be used. Three attempts to enter the correct PIN may be made. If after the three entries the correct PIN has not been entered, the card becomes blocked. To unblock the card an unblocking/super PIN code must be entered. Ten attempts to enter the correct unblocking code are permitted, if after ten attempts the correct code has not been entered, the SIM card is corrupted and becomes useless.

Another option available for the SIM card is call barring. If subscribed to, the call barring of incoming and/or outgoing calls may be accomplished by entering a special key sequence. The key sequence includes a "barring code", which determines the type of restriction incorporated, and a password to validate the request. The initial password is provided when you subscribe to the service. The password can be changed by entering a set key sequence.

A valid standard sized SIM card can be used in any working GSM transceiver, regardless of the manufacturer, which is compatible with the standard size SIM card. To protect the actual unit from unauthorized use, a lock function on the hardware is available. When enabled, this function requires that a three or four digit unlock code be entered, via the unit's keypad, before normal operation of the transceiver can take place. The lock code can be changed by entering a set key sequence.

Note: Further information on set key sequences can be derived from the unit's user guide.

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MANUAL-TEST MODE

3. INTRODUCTION

The Motorola International 8700 personal cellular telephones are equipped with a manual-test mode capability. This capability allows service personnel to take control of the telephone, and by entering certain keypad sequences, make the telephone perform desired functions. To enter the manual-test mode, a Test SIM card (Part No 8102430Z01) is required.

4. TEST SIM CARD INSERTION REMOVAL

The Test SIM card must be inserted into the unit correctly to access manual-test mode. The whole SIM card should slide completely and securely into the slot at the base of the phone. Ensure that the contacts of the card face towards the front of the phone i.e. towards the flip.

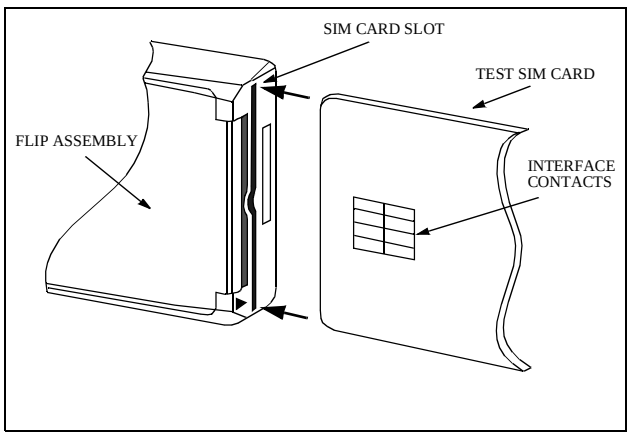

Figure 1. Inserting the Test SIM card

The sliding, card release button will move upwards as the SIM card is inserted. When the button reaches the top of its recess and the card is flush with the base of the phone, it is inserted correctly. To remove the SIM card from the unit, push the sliding SIM card release button downwards. The card will then be pushed out far enough to allow complete removal.

The User Guide contains full information about inserting and removing the SIM card.

5. ACCESSING THE MANUAL-TEST MODE

When the Test SIM card is in place, power up the telephone. Once the initial automatic 'wake up' sequence has taken place correctly, depress the # key (on the units keypad) for three seconds. After three seconds 'TEST' should appear in the display, indicating that the unit is now in the manual-test mode. Table 1 below shows the available manual-test commands and their corresponding results.

Table 1

Command	Result
01#	Exit manual-test mode
19#	Display call processor s/w version
20#	Display modem s/w version
22#	Display speech coder s/w version
57#	Initialize non-volatile memory
58#	Display security code
58xxxxxx#	Change security code
59#	Display lock code
59xxx#	Change lock code
60#	Display International Mobile station Equipment Identity (I.M.E.I.)

Note: If a customer should forget the security code in their unit, it can only be read or changed by using a Test SIM card.

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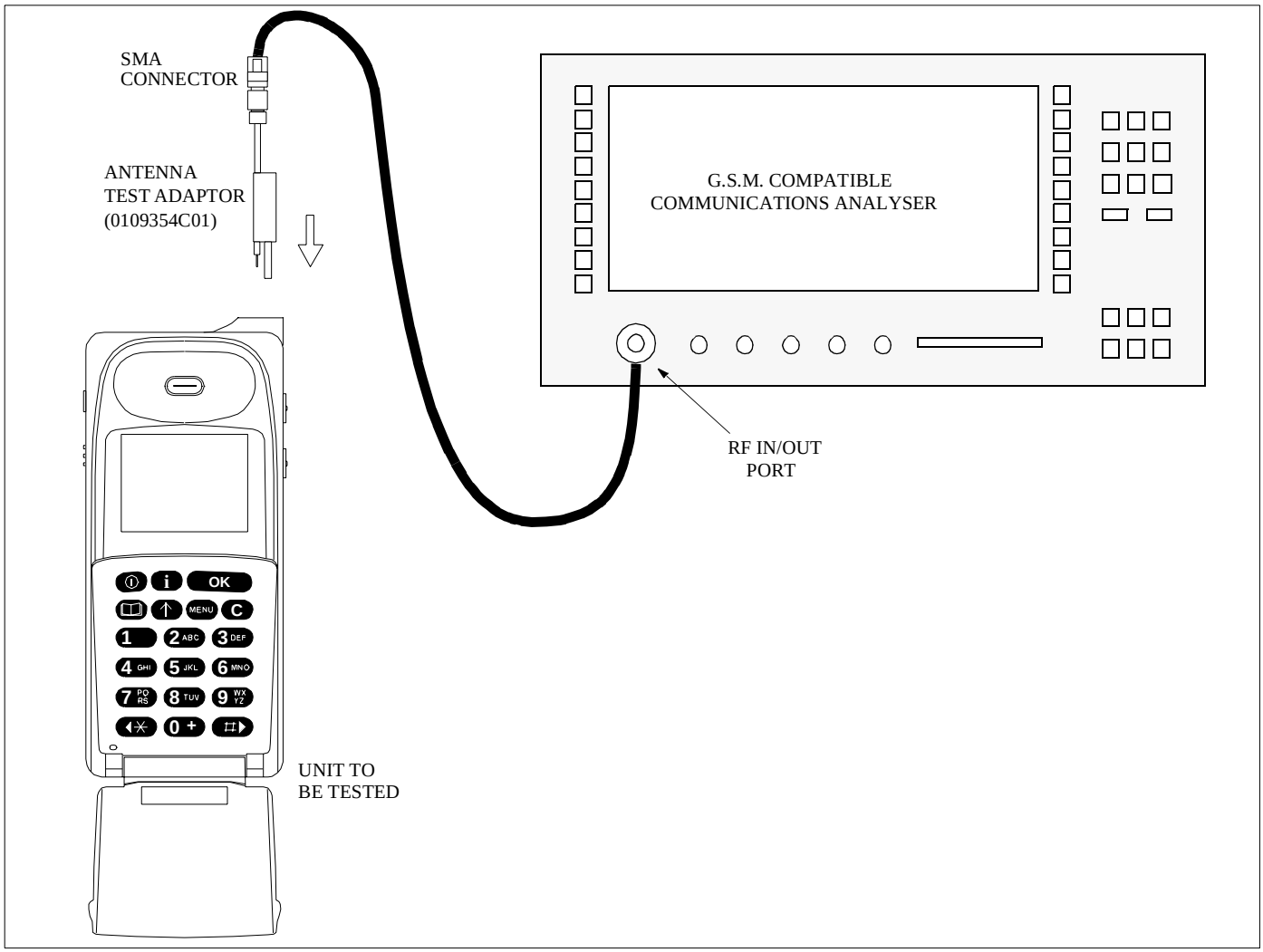

Figure 1: Testing Configuration

VERIFICATION

1. INTRODUCTION

To test an International 8700 cellular telephone, to verify whether or not the unit is functioning correctly, the following equipment will be required:-

- G.S.M. compatible communications analyser.
- Test adaptor (Part No 0109354C01), and appropriate cable/connectors.
- Test SIM card (Part No 8102430Z01).
- Charged battery pack.

2. EQUIPMENT CONFIGURATION

Initially insert the test SIM card into the slot at the rear of the personal cellular telephone. If required, further information on SIM card insertion is available on page 13. Attach the antenna adaptor to the antenna connector of the phone. Slide a charged battery on to the back of the personal telephone, so that the telephone can be powered up. Finally, connect a cable from the test adaptor to the RF in/out port of the communications analyser, and power both the analyser and personal telephone on. The equipment set up shown in Figure 1 should now be in place.

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3. TESTING PROCEDURE

All information required to perform the desired tests and measurements should be obtained from the communication analyser's user manual.

Ensure that the unit being tested is capable of both initiating a call to the analyser, and receiving a call from the analyser. Confirm that the displayed Temporary Mobile Subscriber Identity (TMSI), International Mobile Equipment Identity (IMEI), and dialled number are correct. **When a call is in progress the following tests should be carried out on channels 1, 62 and 124**. The recorded results must be within the acceptable stated limits, if the unit being tested passes all the tests it should be taken as functioning correctly. If the unit being tested fails to conform with any of the expected measurements, it should be taken as faulty and repaired accordingly. The following table states the required tests and tolerances.

TEST TO BE PERFORMED	LOWER LIMIT	UPPER LIMIT
Transmit average phase error (RMS) at peak power		5°
Transmit average phase error (Peak) at peak power		20°
Transmit average frequency error at peak power	-90 Hz	+90 Hz
Transmit power error at level 5 (33 dBm)[4]	-2 dB	+2 dB
Transmit power error at level 7 (29 dBm)[4]	-2 dB	+2 dB
Transmit power error at level 10 (23 dBm)[4]	-3 dB	+3 dB
Transmit power error at level 15 (13 dBm)[4]	-3 dB	+3 dB
Transmit amplitude negative peak flatness	-1 dB	
Transmit amplitude positive peak flatness		+1 dB
Transmit amplitude envelope at -28 us		-70 dB
Transmit amplitude envelope at -18 us		-30 dB
Transmit amplitude envelope at -10 us		-6 dB
Transmit amplitude envelope at 556 us		-6 dB
Transmit amplitude envelope at 564 us		-30 dB
Transmit amplitude envelope at 574 us		-70 dB
Receive Bit Error Test for Class II Residual (at -102 dBm)[4]		2%
Receive Frame Erasure Rate for RES II (at -102 dBm)[4]		0.12%

Note: 1. The transmit average test values should be derived from 10 separate readings.
2. The receive signal strength for transmit measurements should be -85 dBm.
3. The receive test values should be derived from the reception of 20K bits of data.
4. There is approximately 1.8dB loss between the antenna port and the RF SMA connector on the test adaptor. The test specifications are written for the power levels AT THE ANTENNA.

TROUBLESHOOTING

1. INTRODUCTION

Assembly replacement level troubleshooting and repair of an International 8700 personal telephone is limited to isolation and replacement of the following main items only:-

- Antenna
- Battery
- Logic/RF Assembly
- Keypad/Display Board
- Front/Rear Housings
- Keypad Membrane
- Earpiece Speaker
- Microphone Transducer
- Alert Transducer

It is recommended that known good replacement parts and assemblies be available to be used for troubleshooting by substitution, and for replacement of parts/assemblies found to be defective.

If at any time the unit is disassembled, whether repaired or not, it is recommended that a simple test of making a call and checking signal strength and transmit and receive audio quality is carried out. Appropriate action should then be taken on the outcome of the test.

2. TROUBLESHOOTING AND REPAIR

The troubleshooting information in Table 1 shows some typical malfunction symptoms and the corresponding verification and repair procedures. Refer to the disassembly instructions located in the disassembly section of this manual for instructions on removing and replacing parts/assemblies from the personal telephone. If the Logic/RF assembly is replaced a personality transfer will be necessary, see page 21 for more information.

NOTE

Defective Logic/RF assemblies must be replaced with pre-tested, pre-phased assemblies.

3. TESTING AFTER REPAIR

After any repair work has been carried out, the unit should be thoroughly tested to ensure that its operates correctly. This is especially important if the Logic/RF assembly is replaced.

For general repairs which do not include replacing the Logic/RF assembly, simply placing a call and checking signal strength, and transmit and receive audio quality is normally sufficient.

When the Logic/RF assembly is replaced, the unit must have a comprehensive test on a GSM compatible communications analyser. See 'Testing Procedure' on page 16 for further details. The simple test of placing a call on air is usually carried out at this stage to complete the testing procedure.

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Table 1. International 8700 Cellular Telephone Troubleshooting and Repair Chart (Assembly Replacement Level).

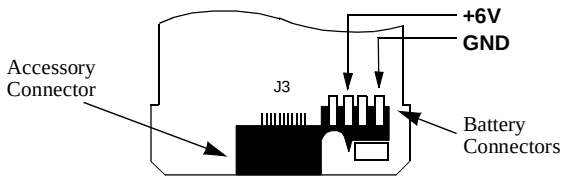
SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
1. Portable telephone will not turn on or stay on.	a) Battery pack either discharged or defective.	Measure battery voltage across a 50 ohm (>1 Watt) load. If the battery voltage is <5.5 V dc, recharge the battery using the appropriate battery charger. If the battery will not recharge, replace the battery. If battery is not at fault, proceed to b.
	b) Battery connectors open or misaligned.	Visually inspect the battery connectors on both the battery assembly and the portable telephone. Re-align and, if necessary, replace either the battery or the battery connector assembly. Removing the battery connector assembly has to be done with extreme care to avoid damaging the PCB. If battery connectors are not at fault, proceed to c
	c) Logic/RF Board Assembly defective.	Gain access to Keypad/Display / main board as described in the DISASSEMBLY instructions in this manual. Remove the Logic/RF Assembly. Substitute a known good assembly. Temporarily connect a +6 V dc supply to the battery connectors as shown below. Depress the **PWR** button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new Logic/RF Board assembly and refer to Section 3 - Testing After Repair. If Logic/RF Board Assembly is not at fault, re-install original Logic/RF Board Assembly and proceed to d.  LOGIC/RF BOARD
	d) Keypad/Display circuit board failure.	Replace the Keypad/Display board. Temporarily connect a +6 V dc supply to the battery connectors as shown above. Depress the **PWR** button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new Keypad/Display board.
2. Portable telephone exhibits poor reception and/or erratic operation (such as calls frequently dropping, weak and/or distorted audio, etc.).	a) Antenna assembly is defective.	Check to make sure that the antenna pins are properly connected to the Logic/RF assembly. If OK, substitute a known good antenna assembly. If the fault is still present, proceed to b.
	b) Logic/RF Board Assembly defective.	Replace Logic/RF Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.
3. Display is erratic, or provides partial or no display.	a) Mating connections to/from Keypad/Display board faulty.	Gain access to Keypad/Display / main board as described in the DISASSEMBLY instructions in this manual. If connections are faulty then replace the RF/Logic assembly and/or the Keypad/Display board as necessary. If connections are not at fault proceed to b.
	b) Keypad/Display board is defective.	Substitute a known good Keypad/Display circuit board, if the fault is not cleared, re-install the original Keypad/Display PCB and proceed to c.
	c) Logic/RF Board Assembly defective.	Replace Logic/RF Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.

Table 1. International 8700 Cellular Telephone Troubleshooting and Repair Chart (Assembly Replacement Level).

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
4. Incoming call alert transducer audio distorted or volume is too low.	a) Connections to/from Keypad/ Display circuit board faulty.	Gain access to Keypad/Display board as described in the DISASSEMBLY instructions in this manual. Check connection from alert transducer and from the Keypad/Display board to the Logic/RF assembly. If connection not at fault, proceed to b.
	b) Alert transducer defective.	Gain access to alert speaker (located on the Keypad/Display board) as described in the DISASSEMBLY instructions in this manual. Unsolder the alert speaker and solder on a known good alert speaker. Place call to portable telephone from landline or other mobile/portable telephone and verify alert signal volume and clarity. If good, re-assemble portable with new alert speaker. If alert speaker not at fault, re-install original alert speaker and proceed to c.
	c) Keypad/Display board is assembly defective.	Replace Keypad/Display board (refer to symptom 1d). If Keypad/Display board is not at fault, re-install original Keypad/Display board and proceed to d.
	d) Logic/RF Board Assembly defective.	Replace Logic/RF Board Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.
5. Portable telephone transmit audio is weak, (usually indicated by called parties complaining of difficulty in hearing voice from portable phone).	a) Microphone connections to Keypad/Display board defective.	Gain access to the Microphone as described in the DISASSEMBLY instructions in this manual. Check connections and if OK, proceed to b.
	b) Microphone defective.	Gain access to microphone (located on keypad membrane). Disconnect and substitute a known good Microphone. Place a call and verify improvement in portable transmit signal as heard by called party. If good, re-assemble portable with new Microphone. If Microphone is not at fault, re-install original Microphone and proceed to c.
	c) Keypad/Display board is defective.	Replace Keypad/Display board (refer to symptom 1d). If Keypad/Display board is not at fault, re-install original Keypad/Display board and proceed to d.
	d) Logic/RF Board Assembly defective.	Replace Logic/RF Board Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.
6. Portable telephone receive audio is weak and/or distorted.	a) Connections to/from Keypad/ Display circuit board defective.	Gain access to Keypad/Display board as described in the DISASSEMBLY instructions in this manual. Check connection from earpiece to Keypad/ Display circuit board. If connection is not at fault, proceed to b.
	b) Earpiece speaker defective.	Gain access to earpiece speaker as described in the DISASSEMBLY instructions in this manual. Substitute a known good earpiece speaker. Place a call and verify improvement in earpiece audio. If good, re-assemble portable with new earpiece speaker. If earpiece speaker not at fault, re-install original earpiece speaker and proceed to c.
	c) Keypad/Display circuit board defective.	Replace Keypad/Display board (refer to symptom 1d). If Keypad/Display board is not at fault, re-install original Keypad/Display board and proceed to d.
	d) Antenna assembly is defective.	Check to make sure antenna pin is properly connected to the Logic/RF Board Assembly. If OK, substitute a known good antenna assembly. If antenna assembly is not at fault, re-install original antenna assembly and proceed to e.
	e) Logic/RF Board Assembly defective.	Replace Logic/RF Board Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.

Table 1. International 8700 Cellular Telephone Troubleshooting and Repair Chart (Assembly Replacement Level).

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
7. Portable telephone will not recognize/accept SIM card	a) SIM card defective	Initially check that the contacts on the card are not dirty; clean if necessary, and check if fault has been eliminated. If the contacts are clean, insert a known good SIM card into the portable telephone. Power up the unit and confirm whether or not the card has been accepted. If the fault no longer exists, the defective SIM card should be replaced. If the SIM card is not at fault, proceed to b.
	b) SIM card retaining assembly defective or mis-aligned.	Gain access to the retaining assembly as described in the DISASSEMBLY instructions in this manual. Examine for defects and replace if necessary. If not at fault, proceed to c.
	c) Logic/RF Board Assembly defective.	Replace Logic/RF Board Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.
8. Hinged mouthpiece does not go on/ off hook correctly (usually indicated by inability to answer incoming calls by flipping the mouthpiece down, or inability to make outgoing calls).	a) Magnet in flip defective.	Replace flip assembly with known good one (refer to the DISASSEMBLY instructions in this manual. Place call to portable phone and verify ability to answer by opening flip. If fault still present, replace original flip assembly and proceed to b.
	b) Reed switch defective.	Gain access to Keypad/Display board as described in the DISASSEMBLY instructions in this manual. Unsolder the reed switch and replace with a known good one. Reassemble unit. Place call to portable phone and verify ability to answer by opening flip. If fault still present, replace original reed switch and proceed to c.
	c) Keypad/Display board is defective.	Replace the Keypad/Display board with a known good one. Place call to portable phone and verify that the fault has been eliminated. If not at fault, proceed to d.
	d) Logic/RF Board Assembly defective.	Replace the Logic/RF board with a known good one. Verify that the fault has been cleared and re-assemble the unit with the new PCB.
9. Vibrator feature not functioning.	a) Vibrator motor defective.	Gain access to Keypad/Display board as described in the DISASSEMBLY instructions in this manual. Check connections, if OK unplug the supply wires to the motor and remove the motor. Replace the motor with a known good one. Reassemble unit. Place call to portable phone and verify vibrator feature functions. If fault still present, replace original vibrator motor and proceed to b.
	b) Keypad/Display board defective.	Replace the Keypad/Display board with a known good one. Place call to portable phone and verify that the fault has been eliminated.
	c) Logic/RF Board Assembly defective.	Replace Logic/RF Board Assembly (refer to symptom 1c). Verify that the fault has been cleared and re-assemble the unit with the new PCB.

PERSONALITY TRANSFER

1. INTRODUCTION

Personality Transfers are required when a phone is Express Exchanged or when the main board is replaced. The different variations (OEM looks) of the International 8700 personal cellular telephones requires that each main board must be configured correctly to ensure that the unit takes on the correct personality required. Therefore, when a main board is replaced its personality must be transferred into the new board, so that it functions correctly in the customers unit. There are two possible methods of transfer.

- Normal Transfer, and;
- Master Transfer

If the defective unit powers up, then the Normal Transfer method should be followed. If the faulty unit will not power up, then a Master transfer will be required to configure the replacement board, once installed.

2. NORMAL TRANSFER

This method allows the personality, selected features and stored phone numbers of a defective radio, to be transferred into a repaired radio. Data is transferred from the donor unit into the recipient unit using a Transfer card (Part No 5104025D01). The instruction steps should be followed in order.

Step 1. Insert the Transfer card into the slot located on the back of the donor unit. Turn the donor unit on, the display should show ‘Clone’.

Step 2. The donor unit is now in the cloning mode, and ready to transfer the first block of data.

Step 3. Enter 021# via the unit’s keypad. This command will cause the first block of information to be uploaded into the Transfer card.

Step 4. While data transfer is taking place between the unit and the card, ‘Please Wait’ will be displayed. After a short period of time, if the data transfer has been completed correctly, ‘Clone’ will re-appear in the donor unit’s display.

Step 5. When the first data block has been successfully uploaded, remove the card from the donor.

Step 6. Insert the Transfer card into the slot located on the back of the recipient unit. Turn the recipient unit on, the display should show ‘Clone’.

Step 7. The recipient unit is now in the cloning mode, and ready to receive the first block of data.

Step 8. Enter 03# via the unit’s keypad. This command will cause the recipient unit to download the first data block from the Transfer card.

Step 9. While data transfer is taking place between the card and the unit, ‘Please Wait’ will be displayed. After a short period of time, if the data transfer has been completed correctly, ‘Clone’ will re-appear in the recipient unit’s display.

Step 10. The second data block must now be transferred. Repeat steps 1 to 9, but enter 022# to program the second data block into the Transfer card.

Step 11. The third data block must now be transferred. Repeat steps 1 to 9, but enter 025# to program the third data block into the Transfer card.

Step 12. When the third block of data has been transferred successfully, remove the Transfer card and check the repaired radio functions correctly. See page 15 for further information.

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3. MASTER TRANSFER

This method of transfer should only be followed when the defective unit will not power up, or complete a Normal Transfer. As mentioned earlier, there are different variations (OEM looks) of the Motorola International 8700 cellular telephones, each model requiring the main board to be configured differently for correct operation. When carrying out a Master Transfer it is not possible to transfer the customers selected features or stored phone numbers, only the model personality can be programmed into the repaired unit.

Each different version of the International 8700 cellular telephone, requires its own Master Transfer card which contains essential set up information. Master SIM cards may be ordered pre-programmed, or created from a Normal Transfer card. The instruction steps should be followed in order.

Step 1. Select the required Master SIM card.

Step 2. Insert the Master Transfer card into the slot located on the back of the repaired unit. Turn the unit on, the display should show 'Clone'.

Step 3. Enter 03# via the unit's keypad. This command will cause the configuration data to be downloaded from the Master Transfer card.

Step 4. While data transfer is taking place between the card and the unit 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient unit's display.

Step 5. When the data block has been transferred successfully, remove the Master Transfer card and check the radio functions correctly. See page 17 for details.

At no point should either 021#, 022# or 025# be entered while a Master Transfer card is in the radio. If either of the stated commands are entered, the master information on the card will be erased. To prevent the above happening the card can be locked by entering 06# via the unit's keypad, with the card inserted. Unlock the card by entering 07#.

Note: If during either transfer process a problem arises, an error message will be displayed. If the Transfer card is removed before the data transfer is completed 'Bad Data on Card' will appear in the display. If either situation arises, the process should be repeated.

4. MASTER SIM CARD CREATION

When required a Master SIM card can be created by:-

Step 1. Insert a Transfer card into a unit which is already configured in the desired way. Turn the unit on, the display should show 'Clone'.

Step 2. Enter 024# via the unit's keypad. This command copies the personality information in the unit onto the Transfer card to create a Master Transfer card.

Step 3. While data transfer is taking place between the unit and the card 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient unit's display.

Step 4. A Master Transfer card has now been created. Lock the card to prevent accidental information erasure (see previous section). Remove the card from the unit, and store until required.

INTERNATIONAL 8700 PORTABLE CELLULAR TELEPHONE DISASSEMBLY

DISASSEMBLY INSTRUCTIONS

1. INTRODUCTION

The International 8700 cellular telephone is assembled using a simple press fit between front and back housings. Before disassembly is started, the antenna cap at the top of the phone and the antenna has to be removed to allow full separation. To disassemble the 8700, a special disassembly tool must be used to prevent damaging the phone.

Reasonable care should be taken during the disassembly and reassembly of the unit in order to avoid damaging or stressing the housing and internal components. Ensure that a properly grounded high impedance conductive wrist strap is used while performing these procedures on electronic units.

CAUTION

Many of the integrated circuit devices used in this equipment are vulnerable to damage from static charges. Ensure that adequate static protection is in place when handling, shipping, and servicing

2. RECOMMENDED TOOLS

The following tools are recommended for use during the assembly/disassembly of the personal telephone.

- Anti-Static Mat Kit 0180386A82; includes:
  - — Anti-Static Mat 66-80387A95
  - — Ground Cord 66-80334B36
  - — Wrist Band 42-80385A59
- Plastic Bladed Tool SLN7223A
- A small flat bladed screw driver,
- Rear Housing Removal Tool 8109972N01

3. DISASSEMBLY PROCEDURE

3.1 DISASSEMBLY PROCEDURE

The following information describes the procedure for removing and accessing various parts of the International 8700.

NOTE

Refer to the mechanical exploded view on page 32, as necessary, while performing the disassembly/assembly procedures.

4. ASSEMBLY PROCEDURE

Once the unit is disassembled and the repair is carried out it then becomes obvious that to assemble the unit, the procedure is the reverse of that previously completed for disassembly. Note that no tools are required for reassembly as the front and back housings snap together.

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1 Carefully prise off the antenna cap using a hard plastic tool.

2 Remove the antenna assembly by simply pulling it out of the housing whilst moving it back and forth. If it proves difficult to remove, remove it after separating the front and back housings.

3 If the antenna assembly has not been removed in Step 2, extend the antenna whip to its full out position before seperating the housings. Align the unit on the rear housing removal tool. Pull the lever upwards to disengage the rear housing tabs from the front housing.

4 The front housing, containing all the internal circuitry, can now be lifted away.

5 Unclip the microphone plug using a plastic bladed tool.

6 Carefully ease the Logic/RF board away from the Keypad/Display board, which connects to it via a 41 pin plug/socket connector.

7 The Logic/RF board can now be removed completely from the front housing.

8 Carefully unclip the plastic slider plate, starting from the opposite side to the SIM card eject button.

9 Unclip the Alert Transducer plug from the keypad PCB

10 Unclip the Vibrator plug from the kepad PCB.

11 Prise out the Keypad/Display board using a plastic bladed tool.

12 To remove the flip, hold it fully open to expose the two slots on the shaft. Using a small jeweller's screwdriver or tweezers, locate the small holes on the hinge cams.

13 Push each hinge cam in turn towards the centre of the flip whilst easing the flip outwards.

14 The keypad membrane is easily removed.

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‘INTERNATIONAL 8700’ EXPLODED DIAGRAM & REPLACEMENT PARTS LIST

REPLACEMENT PARTS LIST		
REF No.	**PART No.**	**DESCRIPTION**
-	S5820AAB	Spare Transceiver
1	S5557A	Spare Main PCB
2	SLF1993A	Spare Keypad PCB
3	0109189C01	Antenna Assembly
4	3809686N03	Antenna Cap
5	0109429C02	Front Housing Assembly
6	1509431C02	Flip
7	6109441C02	Lens with adhesive
9	3809460C01	Volume Buttons
10	3809916N01	Mute Button
11	4183879P27	Spring Compression
12	4709267J01	Cam, Shaft Right
13	4709267J02	Cam, Shaft Left
14	5409849N04	Magnet Cover Label
15	5983583N12	Magnet
16	0109124B06	Assembly Card Reader
17	3209317S01	Speaker Felt
18	3209440C01	Gasket Shielding
19	3209523A05	Gasket Shielding
20	3809917N07	Keypad Actuator (no Mic socket)
21	3509133B05	Mylar Light Trap
22	4009203D01	Keypad Metal Domes
23	0109222S02	Vibrator, includes rubber
24	5009536H11	Microphone
25	5009076E02	Speaker Earpiece includes adhesive
26	5009776E14	Alert Speaker
27	3209319S01	Mic Grommet
28	0109850N07	Rear Housing
29	7509326S01	Speaker Cushion (behind ear-piece)
30	7209005C05	LCD Display 96X32 PIX
31	0109505C10	SIM Card Contacts
32	0909958J04	Accessory/Battery Connector
33	4009060E01	Switches, 3 of
34	4009083C01	Read Switch
35	0909883L04	40 pin connector Keypad PCB
36	2809882L05	40 pin connector Main PCB
37	1309432S01	Escutcheon
38	4209852N02	Rear Housing Clips
39	1509618K03	Antenna Tube

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INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE ACCESSORIES
RECHARGEABLE BATTERY PACKS (GENERAL)

1. INTRODUCTION

The International 8700 personal phone normally operates from a 6.0V dc battery pack. There are a number of battery packs available which include the following;

(i) The Slim Lithium Battery.

(ii) The Slim NiCad Battery.

(iii) The Slim NiCad Battery.

(iv) The Slim NiMH Battery.

(v) The Standard NiCad Battery.

(vi) The XT NiMH Battery.

(vii) The XT LiIon Battery

Full specifications are given in the table below.

Each battery pack is housed in a polycarbonate case, which provides superior impact resistance. Removal of the battery pack is accomplished through a quick-release latch. If required, the User Guide contains information on removing and replacing the battery packs.

2. RECHARGING

The International 8700 has a built in rapid charger. The internal charger can be powered by either the Travel Charger or the Cigarette Lighter Battery Charger. Both these accessories can power the phone for a telephone call or fast-charge a discharged battery (but not both simultaneously).

Batteries can also be charged by either the Desktop Rapid Intellicharge, the Slow Charger, or various car kit options. Note that at the time of release of this manual, the Lithium Ion battery can only be charged by the Desktop Rapid E•P Intellicharge.

Battery	Super Slim NiCad	Slim NiCad	Slim NiMH	Slim LiIon	Standard NiCad	XT LiIon	XT NiMH
Weight (grams) (phone &battery)	185	215	214	155	270	224	295
Volume (cc) (Phone & battery)	165	175	173	165	220	209	220
Talktime (mins)* (approx.)	120-160	165-220	175-235	120-140	210-280	400-460	390-520
Stand-by time** (hours) (approx.)	38	52	56	39	67	127	124
Capacity (mA/Hours)	400	550	600	400	700	1200	1300
E²•P Rapid charger (mins)	60	60	60	60	90	240	120
* Upper talktime figures may be acheived if network supports DTX ** With DRX 2							

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3. ("EXPERT PERFORMANCE") BATTERIES AND CHARGERS

A new series of "Expert Performance" or E•P batteries were introduced with the International 8200/6200/. E•P batteries are marked with the new E•P logo and contain an EPROM which provides data to E•P telephones or E•P chargers. This data specifies the battery's charging characteristics, such as preferred fast charge and trickle charge current. This means that E•P batteries can be used and charged in the most efficient way for maximum performance.

As well as E•P batteries, E•P products include the cigarette lighter adaptor/charger and the new, smaller E•P IntelliCharger. Any product with the E•P symbol is capable of either providing E•P data or interpreting it.

No repairs can be carried out on any of the battery packs. If a rechargeable battery pack becomes defective, it should be replaced.

4. BUILT IN E•P BATTERY FAST CHARGER

All International 8700's contain a built in E•P battery fast charger which can fast charge any Motorola Nickel-Cadmium, Nickel Metal Hydride, or Lithium battery. The charger can also read the data from the E•P batteries for optimum charging performance with that particular battery.

The built in charger obtains its power from either the Cigarette Lighter Adaptor or the Travel Charger. Both supplies monitor the battery feedback line on the accessory connector (pin 10) to provide optimal supply voltage.

With an external charger present and the phone powered off, the battery icon will flash as the battery begins to charge. As the battery charges the icon will stop flashing and the icon's segments will turn on one by one as the battery voltage builds up. The phone uses the extra battery pin on the back of the unit to read information from E•P batteries. The International 8700 also uses a thermistor detect line (between B+ and ground on the battery connectors on the back of the unit) to monitor battery temperature during charging.

If the phone is turned off while the battery charger is operating, the battery icon will continue to flash and the display will show "Battery Charging".

Note that battery charging is suspended while the phone is in a call (because of the extra current demand). The built in charger may delay battery fast charging after an extended call. This is done to counter the effect of heat build-up during a call, and protects the battery from being over-charged due to the elevated temperature being detected by the charger.

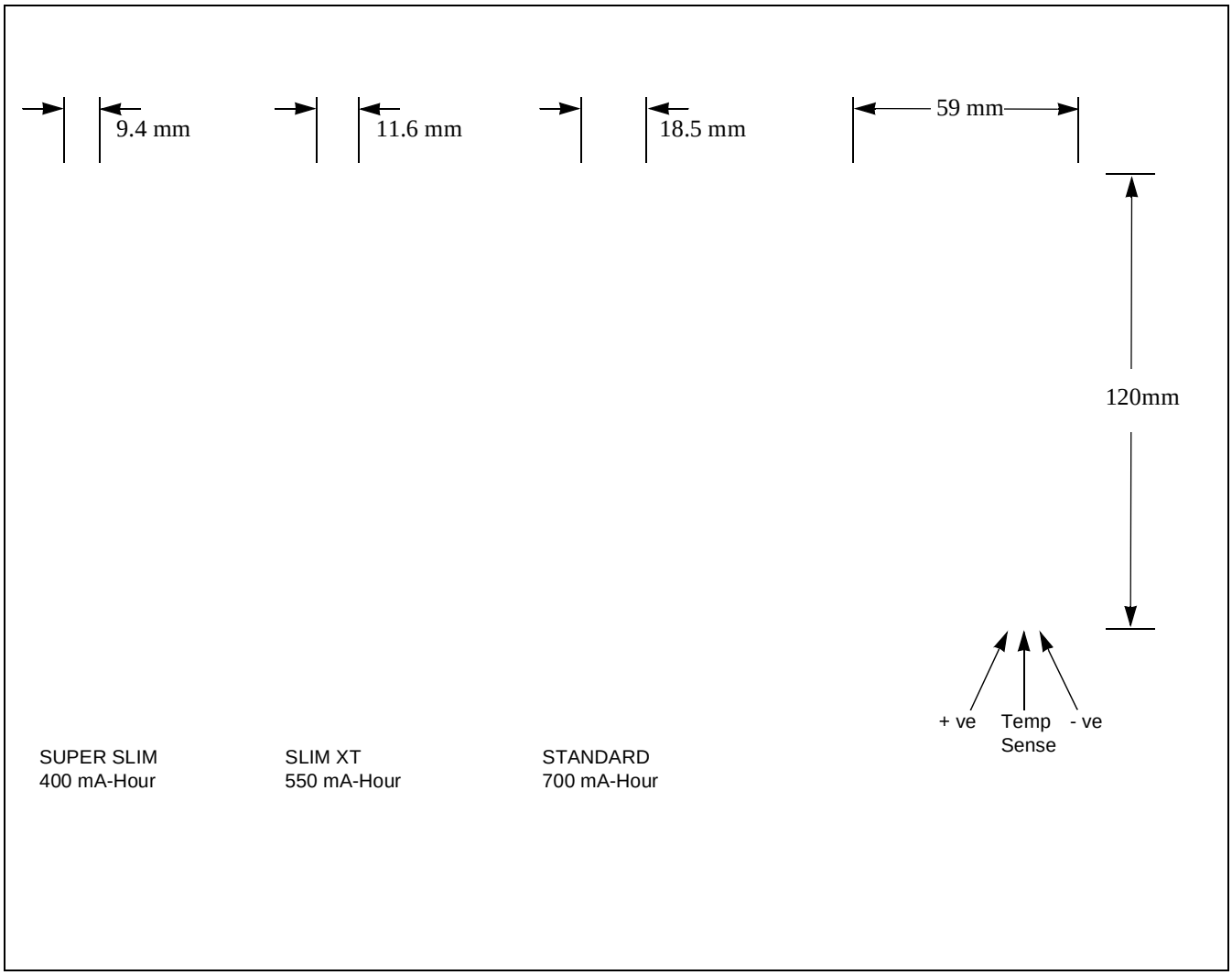

Figure 1. Rechargeable Battery Packs Dimensions and Connections

RECHARGEABLE BATTERY PACKS

1. INTRODUCTION

The International 8700 personal cellular telephones can operate from 6.0 V dc Nickel-Cadmium rechargeable battery packs. Figure 1, shows the dimensions and contact configuration of a selection of rechargeable battery packs.

Each battery pack is housed in a sealed polycarbonate case which provides superior impact resistance. Removal of the

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battery pack is accomplished through a quick-release latch. If required refer to the 'Disassembly Instructions' in this manual, for battery pack removal and replacement information.

2. CHARGING

Battery pack recharging can be accomplished by a number of charging devices, including the original IntelliCharge, the new E•P IntelliCharge desktop rapid charger, Overnight desktop trickle charger, internal charger, and via various vehicle adaptors.

The Battery Pack should be near room temperature when charging.

3. CHARACTERISTICS

Each nickel-cadmium battery pack consists of 5 cells connected in series to provide a nominal 6.0 V dc output. Devices internal to the battery pack provide thermal sensing and short circuit protection.

The voltage of a nickel-cadmium battery remains approximately constant under load until the battery approaches the discharged condition. At this time, a marked decrease in the voltage occurs and the discharged condition (1.04 V per cell) is reached abruptly. Metering to determine the state of charge in this type of battery is difficult and is not normally performed.

CAUTION

Do NOT allow the battery terminals to become shorted together (e.g., a paper clip placed accidentally across the battery contacts) when the battery pack is removed from the portable unit. Sustained high rate discharges permanently damages the battery, voids the battery warranty, and may create a burn or fire

A general characteristic of all rechargeable batteries in storage is self discharge. If the battery is used after unknown periods of storage, it is recommended that it be charged using the overnight charger to obtain maximum capacity.

4. BATTERY MAINTENANCE

The only maintenance required is recharging the battery and keeping the contacts clean, (a pencil eraser works well). Use only a Motorola approved charger. The use of other chargers, unless approved, will void the battery guarantee and may result in permanent damage to the battery and the radio. Follow the charging instructions which accompany each charger.

All battery packs are considered to be non-serviceable. Defective batteries should be replaced.

WARNING

Batteries may explode if disposed of in fire.

5. STORAGE

Battery packs may be stored at room temperature in any state of charge without damage. As previously stated, however, the battery is subject to self discharge and should be recharged after extended storage.

6. MEMORY EFFECT

A nickel-cadmium battery may exhibit a reduced charge capacity (memory effect) caused by continuous overcharge for long periods or repetitive shallow cycling.

If the battery pack is lightly or infrequently used and is allowed to charge over a long period (30-60 days), it may develop memory effect. That is, the voltage may be sufficiently lowered on the first discharging cycle to reduce the effectiveness of radio transmission.

A more common type of memory effect is induced by uniform shallow cycling. For example, if the battery is operated so that it repeatedly delivers 50% of its full capacity, it can temporarily become inactive, and when current demand is increased, it may show a sharp decrease in its ability to deliver proper terminal voltage.

If the battery is exhibiting memory effect, memory can be easily eliminated by completely discharging the battery (deep discharge), and recharging again. One or two deep discharge cycles are usually sufficient to restore the battery to full capacity. New improved chemical processes used by Motorola's cell suppliers have resulted in the virtual elimination of this problem.

7. LOW BATTERY WARNING

When the battery level becomes too low for normal operation, a warning signal (two double beeps) will sound. '**Low Battery**' will appear in the display. When the battery is almost discharged, the phone will automatically turn off.

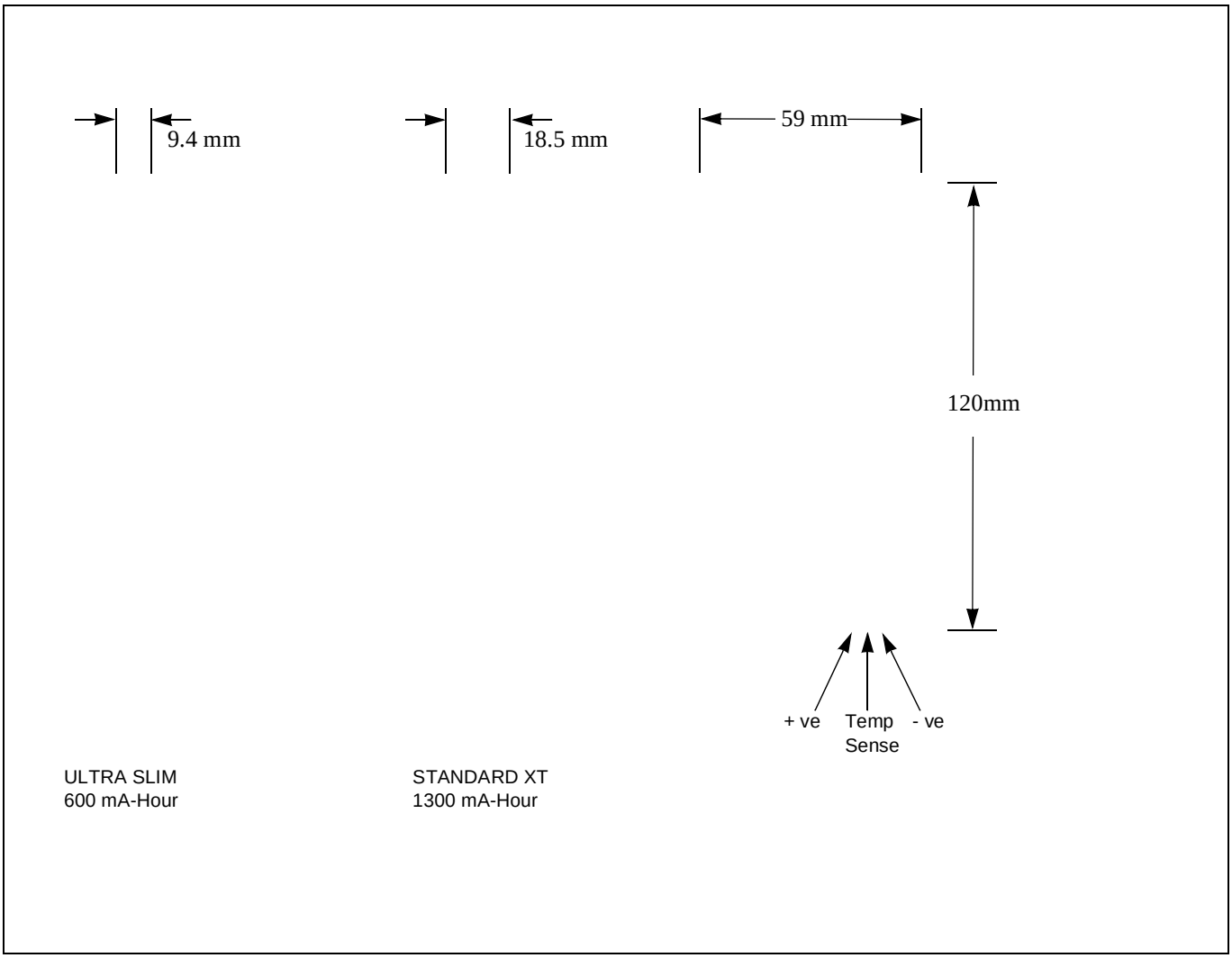

Figure 1. Rechargeable Battery Pack Dimensions and Connections

RECHARGEABLE BATTERY PACKS

1. INTRODUCTION

The International 8700 personal cellular telephones can operate from 6.0V dc Nickel Metal Hydride rechargeable battery packs. The dimensions and contact configuration of the rechargeable battery packs are shown in figure 1.

Each battery pack is housed in a sealed polycarbonate case

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which provides superior impact resistance. Removal of the battery pack is accomplished through a quick-release latch. If required refer to the 'Disassembly Instructions' in this manual, for battery pack removal and replacement information.

2. CADMIUM FREE

In today's global economy, there are increasing efforts to protect both the environment and the health and welfare of the population. Although there are several suppliers of Nickel Metal Hydride cells, while all are lead and mercury free, Motorola has chosen to use only those that have been tested to be cadmium free.

3. CHARGING

Nickel Metal Hydride battery packs should only be charged in Motorola approved chargers. Do not leave a Nickel Metal Hydride battery pack in a charger for more than 24 hours. Overcharging will prevent the battery pack from achieving its maximum life and capacity. Battery pack recharging can be accomplished by a number of charging devices, including the original IntelliCharge, the new E•P IntelliCharge desktop rapid charger, Overnight desktop trickle charger, internal charger, and via various vehicle adaptors.

The Battery Pack should be near room temperature when charging.

4. CHARACTERISTICS

Each Nickel Metal Hydride battery pack consists of cells connected in series to provide a nominal 6.0V dc output. Devices internal to the battery pack provide thermal sensing and short circuit protection.

The voltage of a Nickel Metal Hydride battery remains approximately constant under load until the battery approaches the discharged condition. At this time, a marked decrease in the voltage occurs and the discharged condition is reached abruptly.

CAUTION

Do NOT allow the battery terminals to become shorted together (e.g., a paper clip placed accidentally across the battery contacts) when the battery pack is removed from the portable unit. Sustained high rate discharges permanently damages the battery, voids the battery warranty, and may create a burn or fire

5. RESIDUAL CAPACITY LOSS

Fully charged batteries lose their charged capacity even when not in use. this is commonly referred to as self discharge. Nickel Metal Hydride batteries self discharge at a faster rate than Nickel Cadmium batteries.

Up to 50% of the batteries capacity can be lost after a one week storage period. Therefore it is advisable to recharge battery packs that have not been used for 3 days or more.

WARNING

Batteries may explode if disposed of in fire.

6. BATTERY MAINTENANCE

The only maintenance required is recharging the battery and keeping the contacts clean, (a pencil eraser works well). Use only a Motorola approved charger. The use of other chargers, unless approved, will void the battery guarantee and may result in permanent damage to the battery and the radio. Follow the charging instructions which accompany each charger.

All battery packs are considered to be non-serviceable. Defective batteries should be replaced.

7. STORAGE

Rechargeable battery performance and life is affected by storage conditions. Battery packs should be stored in cool, dry environments to obtain the best operation. Nickel Metal Hydride batteries experience significantly shorter cycle lives after prolonged storage at high temperatures.

8. OPERATING TEMPERATURES

For the best possible performance, battery packs should be used where the ambient operating temperatures are between 0˚C and 40˚C.

9. LOW BATTERY WARNING

When the battery level becomes too low for normal operation, a warning signal (two double beeps) will sound. '**Low Battery**' will appear in the display. When the battery is almost discharged, the phone will automatically turn off.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE ACCESSORIES
LITHIUM ION BATTERY PACKS

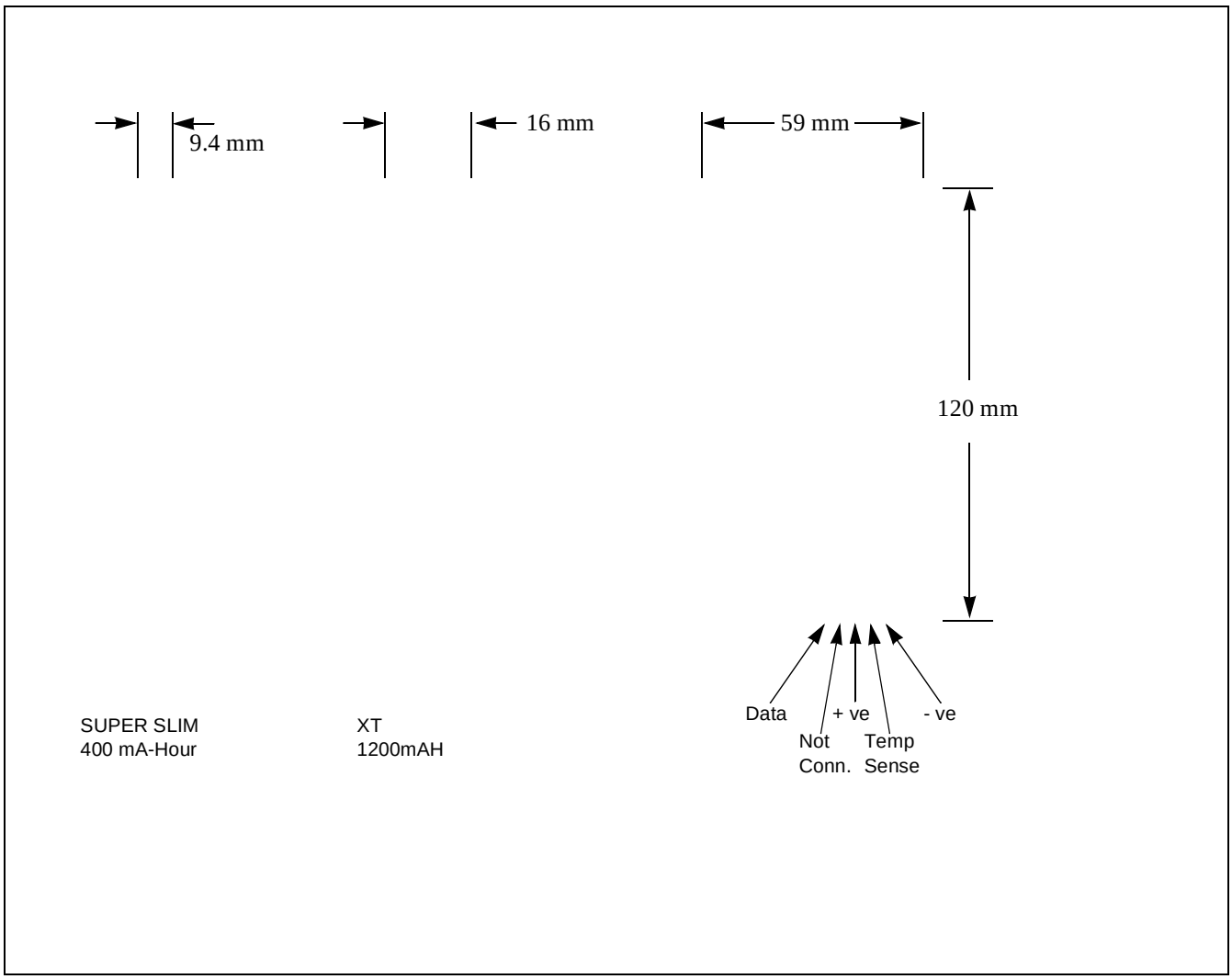

Figure 1. Rechargeable Battery Pack Dimensions and Connections

RECHARGEABLE BATTERY PACKS

1. INTRODUCTION

The International 8700 personal cellular telephones can operate from 7.2V dc Lithium Ion rechargeable battery packs. Its dimensions and contact configuration of the rechargeable battery pack are shown in figure 1.

Each battery pack is housed in a sealed polycarbonate case which provides superior impact resistance. Removal of the battery pack is accomplished through a quick-release latch. If required refer to the 'Disassembly Instructions' in this manual, for battery pack removal and replacement information.

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2. CHARGING

Lithium Ion battery packs should only be charged in Motorola approved E•P chargers. Do not leave any battery packs in a charger for more than 24 hours. Overcharging will prevent the battery pack from achieving its maximum life and capacity. The original first generation Lithium Ion battery packs can only be recharged by the new E•P IntelliCharge desktop rapid charger. Charging of the battery pack is possible with the battery attached to the portable telephone, or by itself.

The Battery Pack should be near room temperature when charging.

3. CHARACTERISTICS

Each Lithium Ion battery pack consists of 2 cells connected in series to provide a nominal 7.2V dc output. Devices internal to the battery pack provide thermal sensing and short circuit protection.

The voltage of a Lithium Ion does not stay as constant under load as a similar Ni-Cad. Instead it has a slow ramp down of operating voltage with a gentle roll-off as the fully discharged condition is reached.

CAUTION

Do NOT allow the battery terminals to become shorted together (e.g., a paper clip placed accidentally across the battery contacts) when the battery pack is removed from the portable unit. Sustained high rate discharges permanently damages the battery, voids the battery warranty, and may create a burn or fire

4. BATTERY MAINTENANCE

The only maintenance required is recharging the battery and keeping the contacts clean, (a pencil eraser works well). Use only a Motorola approved charger. The use of other chargers, unless approved, will void the battery guarantee and may result in permanent damage to the battery and the radio. Follow the charging instructions which accompany each charger.

All battery packs are considered to be non-serviceable. Defective batteries should be replaced.

WARNING

Batteries may explode if disposed of in fire.

5. STORAGE

Fully charged batteries lose their charged capacity even when not in use. This is commonly referred to as self discharge. Any batteries which have been left for an extended period of time should be recharged before use. Rechargeable battery performance and life is affected by storage conditions. Battery packs should be stored in cool, dry environments to obtain the best operation.

6. OPERATING TEMPERATURES

For the best possible performance, battery packs should be used where the ambient operating temperatures are between 0˚C and 40˚C.

7. LOW BATTERY WARNING

When the battery level becomes too low for normal operation, a warning signal (two double beeps) will sound. '**Low Battery**' will appear in the display. When the battery is almost discharged, the phone will automatically turn off.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE ACCESSORIES

TRAVEL BATTERY CHARGER

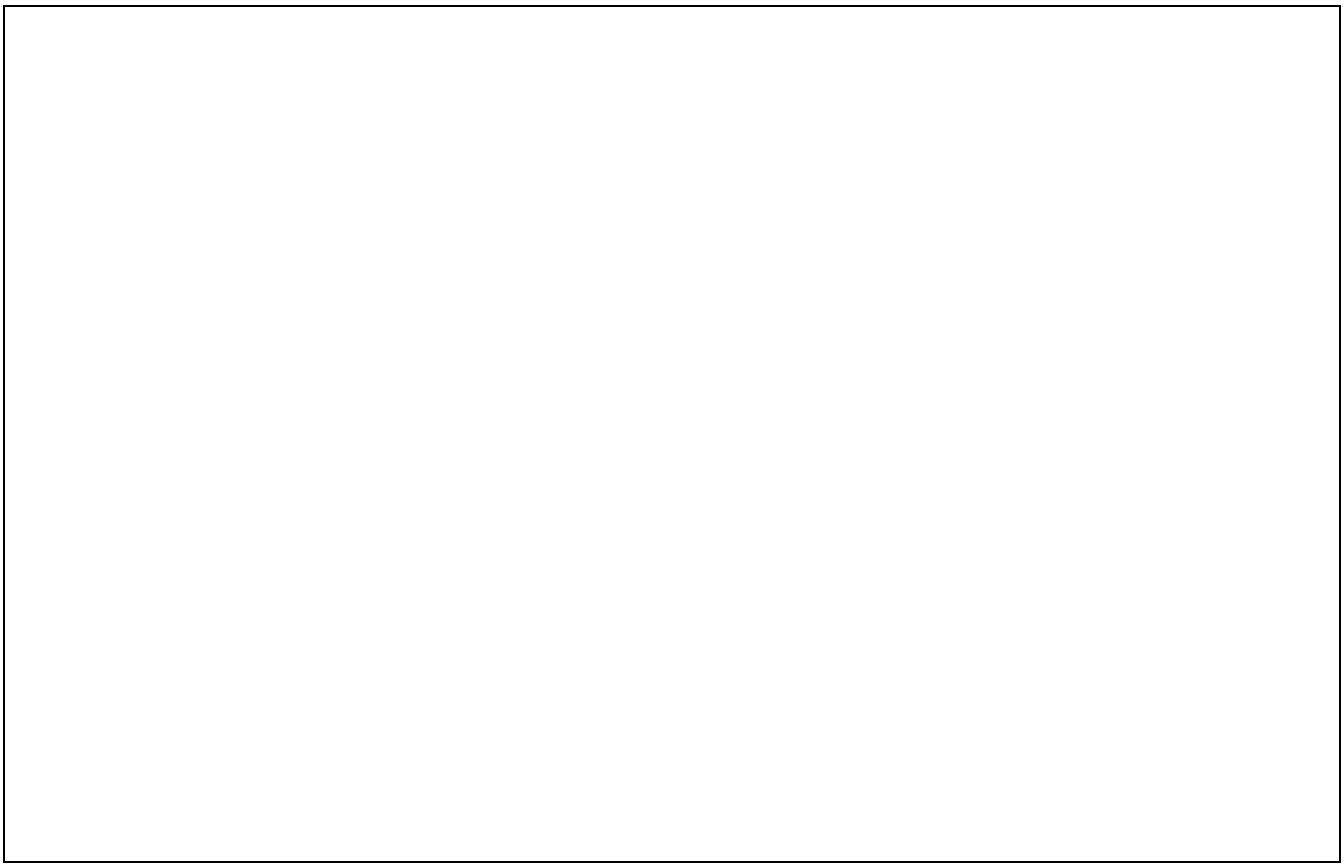

Figure 1. E•P Travel Battery Charger

E•P TRAVEL BATTERY CHARGER

1. DESCRIPTION

The E•P Travel Charger is a mains transformer with a built in rectifier. Circuitry inside the box converts the ac mains to a 9V dc supply. The output lead has a plug termination which fits into the accessory socket on the base of the International 8700 portable phone. Any battery fitted to the phone will be charged while the transformer is attached.

The Travel Charger monitors the battery feedback line (pin 10) in the external connector to provide optimal supply voltage.

The Travel Charger is also used to supply power to the Desktop Rapid Intellicharge.

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2. MODEL COMPLEMENT

Due to the variation in countries' mains power supply voltage, two versions are available:

Travel Charger Transformer (Euro) SPN4222A

Travel Charger Transformer (UK) SPN4221A

3. OPERATION

A green LED on the transformer indicates that mains power is switched on. When the charger is plugged into the personal phone, the phone will switch on (if not already) to allow for normal operation.

The battery icon in the display flashes as the battery is being charged. As the battery reaches the fully charged condition, the icon flashes at a slower rate until it is on continuously. The internal charger operation is discussed in more detail on page 38 of this manual.

4. MAINTENANCE

The Travel Charger is considered non-serviceable. If it becomes faulty, it should be replaced with a new one.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE ACCESSORIES

CIGARETTE LIGHTER ADAPTOR/CHARGER

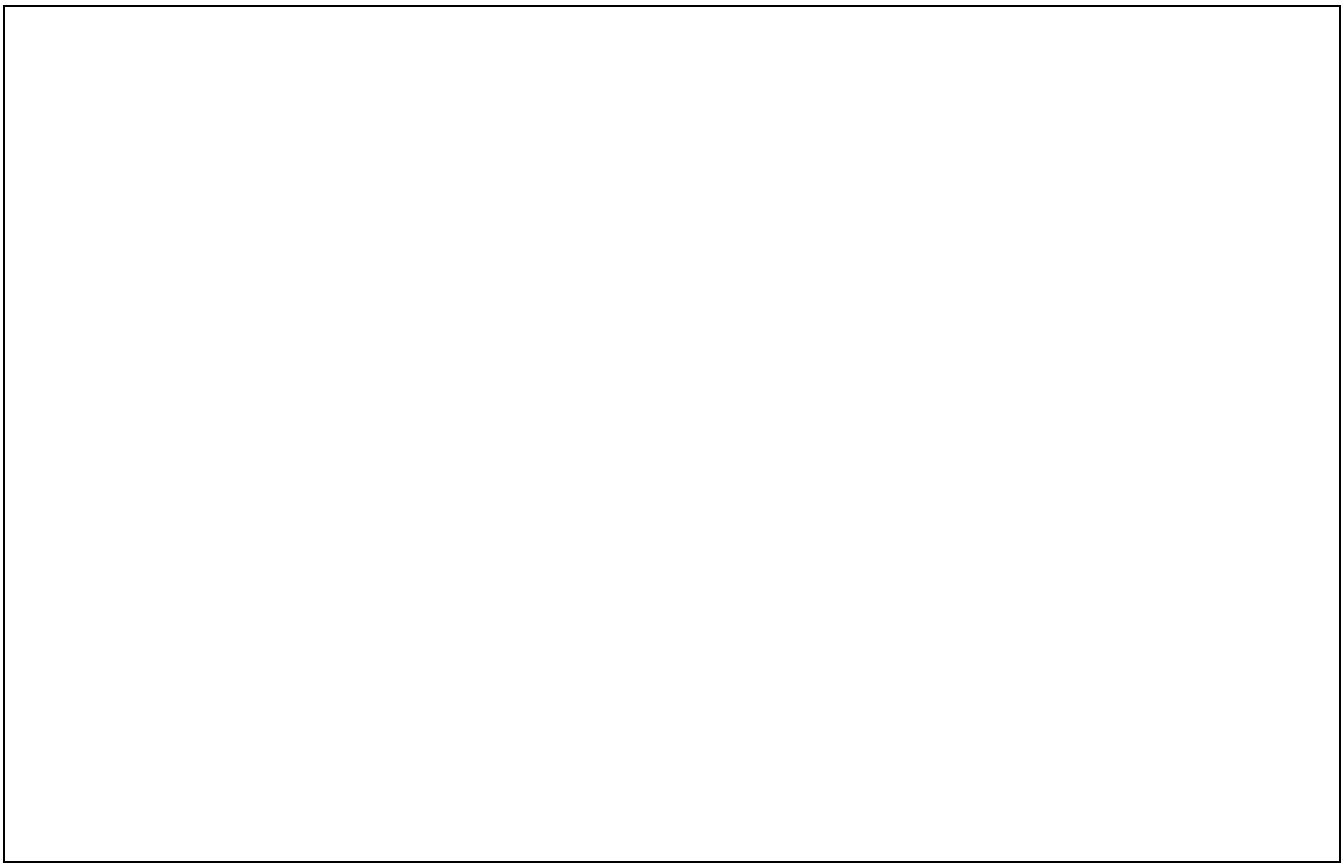

Figure 1. E•P Cigarette Lighter Adaptor/Charger

E•P CIGARETTE LIGHTER ADAPTOR/CHARGER

1. DESCRIPTION

The cigarette lighter adaptor/charger allows an International 8700 to operate using a vehicle's electrical system. It simply plugs into a cigarette lighter socket and has a length of coil cord attached which applies power to the accessory connector on the phone. A regulator inside the adaptor reduces the vehicle's 12 V down to the phone's normal battery voltage.

The adaptor can power the phone for call operation even if the phone's battery is fully discharged. It also supplies DC power to fast charge a battery when the phone is not in a call, but cannot do both at the same time.

An LED is located on the main body of the adaptor to indicate that it is correctly inserted into the cigarette lighter socket and that DC is applied. The Travel Charger monitors the battery feedback line (pin 10) in the external connector to provide optimal supply voltage.

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2. MODEL COMPLEMENT

Only one version is available for 12V DC negative earth electrical systems**:**

Cigarette Lighter Adaptor/Charger SLN9933

3. OPERATION

A green LED on the body indicates DC power is applied. When the charger is plugged into the personal phone, the phone will switch on (if not already) to allow for normal operation.

The battery icon in the display flashes as the battery is being charged. As the battery reaches the fully charged condition, the icon flashes at a slower rate until it is on continuously. The internal charger operation is discussed in more detail on page 36 of this manual.

4. MAINTENANCE

A 1.5 A glass tube fuse is located in the tip of the adaptor. Unscrew the tip to gain access if suspect. Apart from the fuse, the adaptor is considered non-serviceable. If it becomes faulty, it should be replaced with a new one.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE ACCESSORIES

IntelliCharge™ BATTERY CHARGER

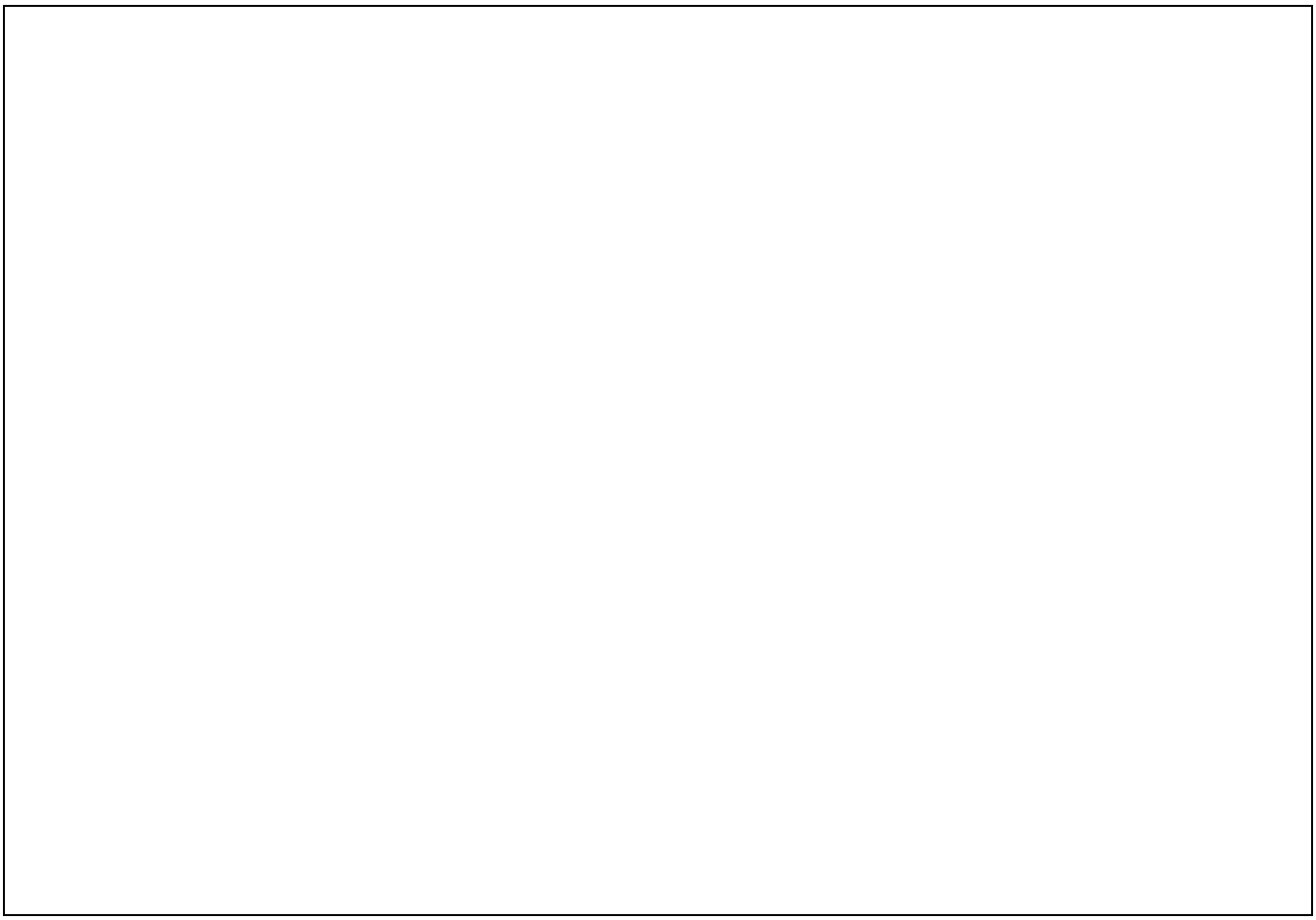

Figure 1. Intellicharge Battery Charger

INTELLICHARGE BATTERY CHARGER

1. DESCRIPTION

The new Intellicharge Battery Charger offers the same function as the original Intellicharger, but has E•P compatibility with a smaller overall size. It has two pockets for batteries, the front one allowing battery charging with the battery still attached to the phone.

The E•P function means that the Intellicharger will optimally charge E•P compatible batteries in the shortest time possible. Any other non-E•P Motorola personal battery can still be charged in the Intellicharger. The charger has indicator LED's to show the approximate charge capacity whilst a battery is being charged.

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The Travel Charger, as well as powering the phone's internal charger, is used to power the Intellicharger direct from the mains supply.

2. MODEL COMPLEMENT

Due to the variation in countries' mains power supply voltage, two transformers are available.

Dual Pocket Charger Base	**SPN4266A**
Travel Charger Transformer (Euro)	**SPN4222A**
Travel Charger Transformer (UK)	**SPN4221A**

3. OPERATION

The charger has two sets of indicators at the front to provide charging status information. The lower indicators give the front slot status and the upper indicators show charge status for the rear slot.

If two batteries are placed in the charger at the same time, the one in the front slot is always charged first. Under this condition the red LED on the upper indicators flashes slowly to show that the rear slot is in stand-by mode.

A rapid flashing yellow LED indicates that the battery in the relevant pocket is out of temperature or voltage range for rapid charging. Rapid charging automatically continues when the battery is back in range. A fast flashing red LED indicates a faulty or out of temperature range battery. Under this condition, the battery will not be charged.

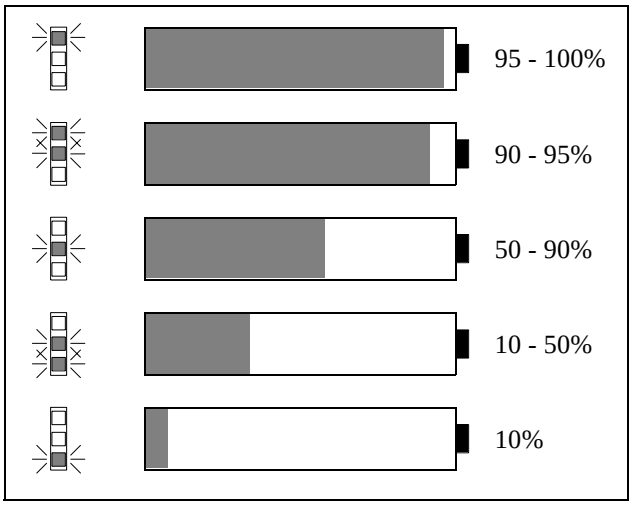

Figure 2. Battery Charge Level Indication.

Note that when charging a Lithium Ion battery, the charger switches immediately to trickle charge mode. Consequently, the corresponding indicator LED will turn green, but this does not indicate that the battery is fully charged.

The Intellicharger and batteries should be at normal room temperature (20°C) for optimum charging and operation performance.

4. MAINTENANCE

The Intellicharger is considered non-serviceable. If it becomes faulty, it should be replaced with a new one. The base and transformer are available separately, if required.

INTERNATIONAL 8700 PERSONAL CELLULAR TELEPHONE
GLOSSARY OF GSM TERMS

Glossary of GSM Terms

Note: Those marked ** are Motorola specific abbreviations.

A Interface	Interface between MSC and BSS
A3	Authentication algorithm
A5	Stream cipher algorithm
A8	Ciphering key generating algorithm
AB	Access Burst
A-bis	Interface between BSC and BTS
ACCH	Associated Control CHannel
ACSE	Association Control Service Element
AGCH	Access Grant CHannel
AOC	Advice of charge
ARFCN	Absolute Radio Frequency Channel Number
ARQ	Automatic Request for retransmission
ASIC	Application Specific Integrated Circuit
AUC	Authentication Centre
AUT(H)	Authentication
BA	BCCH Allocation
BAIC	Barring of All Incoming Calls
BAOC	Barring of all Outgoing Calls
BCC	Base Transceiver Station (BTS) Colour Code
BCCH	Broadcast Control CHannel
BCD	Binary Coded Decimal
BCU	BTS Control Unit **
Bm	Full-rate traffic channel
BN	Bit Number
BS	Base Station
BSC	Base Station Controller
BSIC	Base Transceiver Station Identity Code
BSS	Base Station System
BSSAP	BSS Application Part (DTAP and BSSMAP)
BSSC	Base Station System Control Cabinet **
BSSMAP	Base Station Systems Management Application Part
BSSOMAP	BSS Operation and Maintenance Application Part
BSU	Base Site Controller Unit **
BTS	Base Transceiver Station
CA	Call Allocation
CBCH	Call Broadcast CHannel
cc	Call Control
cc	Country Code
CCBS	Completion of Calls to Busy Subscribers
CCH	Control CHannel
CCCH	Common Control CHannel
CFS	Call Forwarding on mobile Subscriber busy
CFU	Call Forwarding Unconditional
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CM	Connection Management
COLP	Connected Line identification Presentation
COLR	Connected Line identification Restriction
CONF	Conference Call add on
CSPDN	Circuit Switched Public Data Network
CUG	Closed User Group
CW	Call Waiting
DB	Dummy Burst
DBS	Distributed Base Station **
DCCH	Dedicated Control CHannel
DET	Detach
DFE	Decision Feedback Equaliser
DISC	DISConnect
DL	Data Link (layer)
Dm	Control Channel (ISDN terminology applied to mobile service)
Dm	Signalling channel
Dp	Dialled Pulse
DRCU	Diversity Radio Channel Unit**
DRX	Discontinuous Reception
DTAP	Direct Transfer Application Part
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency (tone signalling type)
DTX	Discontinuous Transmission
E	erlang
Eb/No	Energy per Bit/Noise floor
EC	Echo Canceller
Ec/No	Ratio of energy per modulating bit to the noise spectral density
EIR	Equipment Identity Register
EIRP	Effective Isotropic Radiated Power
EMC	Electromagnetic Compatibility
EMX	Electronic Mobile Exchange **
ETSI	European Telecommunications Standards Institute
FACCH	Fast Associated Control CHannel
FACCH/F	Full rate Fast Associated Control CHannel
FACCH/H	Half rate Fast Associated Control CHannel
FB	Frequency correction Burst
FCCH	Frequency Correction CHannel
FEC	Forward Error Correction
FN	Frame Number
FTAM	File Transfer Access Management
GMSC	Gateway Mobile Services Switching Centre
GMSK	Gaussian Minimum Shift Keying
GSM	Groupe Special Mobile
GSM MS	GSM Mobile Station
GSM PLMN	GSM Public Land Mobile Network
HANDO	Handover
HDLC	High Level Data Link Control
HLR	Home Location Register
HOLD	Call Hold (Supplementary Service)
HPLMN	Home PLMN
HPU	Hand Portable Unit
HSN	Hopping Sequence Number
I	Information (frames)
IA5	International Alphanumeric 5
ID	IDentification
IMEI	International Mobile Equipment Identity
IMM	IMMediate assignment message
IMSI	International Mobile Subscriber Identity

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IN	Intelligent Network
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IWF	Interworking Function
Kc	ciphering Key
Ki	Individual subscriber authentication key
LAC	Location Area Code
LAI	Location Area Identification (Identity)
LAPB	Link Access Procedure 'B' (balanced) channel
LAPDm	Link Access Procedure 'DM' (mobile 'D') channel
Lm	Traffic channel (with capacity lower than Bm)
LPC	Linear Predictive Code
LR	Location Register
MA	Mobile Allocation
MAH	Mobile Access Hunting
MAI	Mobile Allocation Index
MAIO	Mobile Allocation Index Offset
MAP	Mobile Application Part
MCC	Mobile Country Code
MCI	Malicious Call Identification
MD	Mediation Device
ME	Mobile Equipment
MF	Multi-Frequency (tone signalling type)
MLSE	Maximum Likelihood Sequence Estimator
MM	Mobility Management
MMI	Man Machine Interface
MNC	Mobile Network Code
MO	Mobile Originated
MO/PP	Mobile Originated Point to Point messages
MoU	Memorandum of Understanding
MRN	Mobile Roaming Number
MS	Mobile Station
MSC	Mobile Services Switching Centre
MSCM	Mobile Station Class Mark
MSIN	Mobile Station Identification Number
MSISDN	Mobile Station international ISDN number
MSRN	Mobile Station Roaming Number
MT	Mobile Termination
MTP	Message Transfer Part
MT/PP	Mobile Terminated Point to Point messages
NB	Normal Burst
NE	Network Elements
NET	Norme European de Telecommunications
NM	Network Management
NHC	Network Management Centre
O&M	Operations and Maintenance
OACSU	Off Air Call Set-Up
OCB	Outgoing Calls Barred
OMAP	Operations and Maintenance Application Part (previously was OAMP)
OMC	Operations and Maintenance Centre
OMCR	Operations and Maintenance Centre - Radio Part
OMCS	Operations and Maintenance Centre - Switch Part
OSI	Open System Interconnection
PAD	Packet Assembly Disassembly facility
PCH	Paging CHannel
PDN	Public Data Networks
PIN	Personal Identification Number
PLMN	Public Land Mobile Network
POTS	Plain Old Telephone Service (basic telephone services)
PSPDN	Public Switched Packet Data Network
PSTN	Public Switched Telephone
PTO	Public Telecommunications Operator
QOS	Quality of Service
RAB	Random Access Burst
RACH	Random Access CHannel
RBDS	Remote BSS Diagnostic Subsystem **
RBU	Remote Base Station Unit (PCN) **
RCU	Radio Channel Unit **
REC	RECommendation
REL	RELease
RELP-LTP	Regular Pulse Excitation - Long Term Prediction
REQ	REQuest
RFCH	Radio Frequency CHannel
RFN	Reduced TDMA Frame Number
RLP	Radio Link Protocol
ROSE	Remote Operations Service Element (a CCITT specification for O&M)
RXCDR	Remote Transcoder Unit **
RXLEV	Received signal level
RXQUAL	Received signal quality
SABM	Set Asynchronous Balance Model
SACCH	Slow Associated Control CHannel
SAPI	Service Access Point Indicator (Identifier)
SB	Synchronisation Burst
SC	Service Centre
SCCP	Signalling Connection Control Part
SCH	Synchronisation CHannel
SCP	Service Control Point - an intelligent network entity
SDCCH	Stand-alone Dedicated Control CHannel
SDL	Specification Description Language
SFH	Slow Frequency Hopping
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSCB	Short Message Service Call Broadcast
SND	SeND
SP	Signalling Point
SRES	Signed RESponse (authentication)
SS	Supplementary Service
SS	System Simulator
STP	Signalling Transfer Point
SYSGEN	SYStem GENeration
TA	Terminal Adaptor
TA	Timing Advance
TCAP	Transaction Capabilities Application Part
TCH	Traffic CHannel
TCH/F	A full rate TCH
TCH/FS	A full rate speech TCH
TCH/HS	A half rate speech TCH
TCP	Transmission Control Protocol
TDMA	Time Division Multiple Access
TE	Terminal Equipment
TMN	Telecommunications Management Network
TMSI	Temporary Mobile Subscriber Identity
TN	Timeslot Number
TRX	Transceivers
TTY	TeleTYpe (refers to any terminal)
TS	Time Slot
TUP	Telephone Users Part
UI	Unnumbered Information frame
Um	Air Interface
VAD	Voice Activity Detection
VLR	Visited Location Register
VLSI	Very Large Scale Integration (IC)
VPLMN	Visited PLMN
XC	Transcoder
XCDR	Transcoder **
3PTY	Three ParTY service

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INTERNATIONAL 8700 PORTABLE CELLULAR TELEPHONE NOTES

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68P09304A68-O
1/6/96

Greater China Cellular Subscriber Division

Product Service Preview

GSM GC87

Models: S5904AAB - GC87, for PRC market
S5895AAB - GC87, for Hong Kong market
S5901AAB - GC87, for Taiwan market

Transceivers: S5904AAB - SWF1617, for PRC market
S5895AAB - SWF1617, for Hong Kong market
S5901AAB - SWF1617, for Taiwan market

Description:

Weight and Volume:

Weight with 1200 mAH LiIon battery = 213 grams
Volume = 208 cc

Electrical Design

45% reduction in transmission power consumption over 8400/8500.
60% reduction in standby current drain.

Housing

The same as GSM 8500.

Display/Indicator

The 8700 will use the same display as the International 8500. The display consists of a 96 x 32 pixelized matrix grid display, offering up to 4 lines of English characters in a 37 x 26 mm viewing area. A segmented battery icon, a five-segment signal strength indicator, and seven-independent icons will also appear in the display. In idle mode, the display will supply information on time-before-battery-discharge, and signal strength.

Lens

The lens will be exactly the same as the Greater China 8500 Look II, except for the product name. The display will be surrounded by a lens with small border, to maximize viewing area. No internal circuitry should be visible. The “GSM” logo printing will be appearing directly below the display on the left side of the lens. “GC87” will appear directly below the display on the right side of the lens. The remaining lens area will be gloss black in color. The printing will be gold.

Flip

The flip will be the same as the Greater China 8500 Look II, except that the Motorola Logo will appear on the inside of the flip. The top of the closed flip will have a symmetrical escutcheon pocket, positioned 3 mm from the top of the flip. The general shape will have rounded corners. The nameplate will contain Motorola branding centered, in gold, on a flossy black background, to be placed in the escutcheon pocket. The printing appears behind a coating of clear plastic. The only printing on the nameplate will be the Motorola logo in gold letters.

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Greater China Cellular Subscriber Division

Product Service Preview

GSM GC87

Keypad

The same as GSM 8500 (N05) Look II.
External Keys are the same as the International 8500 including a SIM eject, and volume up and down key and dedicated mute key.
The earpiece will be similar to the 8500, however, it will have additional slots in the recessed oval ring.
A new dynamic speaker design will be used to enhanced audio quality.
The SIM card is similar to the 8500.

Compatibility: The GC87 is backward compatible with the existing GSM batteries and accessories.

Feature enhancements: Same as GSM8500 with the minor MMI differences:
Battery Meter Graphic has been improved.
Fast Access Menu now includes on-screen image feedback.
Fast Access +0 no longer functions (Previously it controlled the ringer volume)

NOTE: Consult user manual for operation and description of the above new features.

Field Service Plan:

L-0 Exp. Exch: Not available in PRC.

L-1 Distribs.: L-1 spares list is not available yet.
GC87 -- L2.9 service manual (68P09392A89) will be available to be ordered in mid September.

L-2 Distribs.: Not Available until Q4, 1996

Motorola Sub.: - Logistics will support component part sales to Motorola HTC only.
- Obtain part numbers from MACCIMS.

New Service Tools / Equipment:

Use the same service tools as GSM 8500

8109972N01	Ultralite opening fixture
SKN4683A	8 pin modular cable w/coax
SKN4636A	datalogger cable
SYN4080A	Extender Board
0109354C01	Ultralite Gizmo

WinGATE 22 - Test bay. Available through Greater China Test Equipment Group. Contact George Klingerhoffer at Libertyville.

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Greater China Cellular Subscriber Division

Product Service Preview

GSM GC87

L-3 Service Documentation:

Contact Libertyville BB215 or HK Field Service Support to obtain: schematic, component overlays and circuits training lessons.

REPARABILITY:

There are seven (7) cans that cover a large section of the RF side. It is important that the cans are put on correctly. There is no good and fast way to repair the cans at the present time. We are currently evaluating different systems to find an efficient rework system that will ensure reliable repair of the cans and the parts under the cans.

Circuit Highlights:

RF Differences from 8200 to 8700

The block diagrams are similar except for the following differences:

- GIFSYN IC is used instead of GUSS and IF ICs.
- RF circuits operate at 3V except for charge pump and PAC IC supplies which are at 4.75V and TX Exciter, PA driver and the PA are at B+.
- The T/R and antenna-accessory port switching are done by GaAsFET switches versus PIN diodes. Normally, the RF switch is muted. GSM8700 does not have RF Mute, that is why the switch is used.
- RX Mixer is muted during GIFSYN setup.
- 2nd LO frequencies is at 306 Mhz.
- Receiver IF frequency is 153 Mhz.
- TX IF frequency is 108 Mhz.
- TX and RX Enable signals.
- No TX clean up filter and TX VCO Buffer Amplifier.
- TX offset VCO frequency is at 216 Mhz.
- PAC IC supply is enabled during transmit only.

LOGIC:

U201 GIF-SYN IC - The GIF-SYN IC controls 4 different oscillators, the 13Mhz main reference, the RX, 306Mhz (used for RX-IF), 216Mhz (used for TX-IF). The regulated voltages used by the oscillators are also accomplished by the GIF-SYN. Although the charge pump voltages are supplied by R4.75. The GIF-SYN is also responsible for converting the RX-IF (153Mhz) to base-band of 67.708Khz. The base-band will be output in terms of I and Q (which are in quadrature). Vise-versa is true for the transmit, GIF-SYN receives TX I and Q from the modem and modulates them onto an IF of 108Mhz. A -26dbm step attenuator is also contained internally to the GIF-SYN this enable to IC to increase its operating range. The AGC circuit is also internal to this IC.

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U900 GCAP IC - The GCAP contains 5 different voltage regulators, L5.00, R4.75, L2.75, R2.75 and VREF. Battery charger circuitry is contained internally. Analog audio is routed into and out of the IC. SW_A+ and BATT B+ levels are generated and sent to the BIC. The switched (kick-up) supply is controlled by this IC and is driven by a 290Khz internal clock. It is also responsible for ignition sense and power-up. RESET is also initially driven low by this chip.

U703 BIC4.01 (bus interface chip) - The BIC is responsible for all communication with external devices, via the uplink and downlink lines. It contains the Digital to Analog and Analog to Digital converters. Digital speech data from the DHFA is routed to the speech coder via UPLINK_AUD by the BIC and digital speech data from the speech coder is routed to the DHFA via DOWNLINK_AUD. The 13Mhz clock is received from the GIF-SYN and converted to 13_DCLK_B, which is routed to the logic ICs.

U704 - This IC is the phones Random Access Memory. 1M low voltage RAM.

U702 EPROM - This IC contains the phone's software. 8 Meg low voltage Flash IC. This replaces the two IC on the 8500.

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GSM 6700 8700_K06_t01

GSM Service Support
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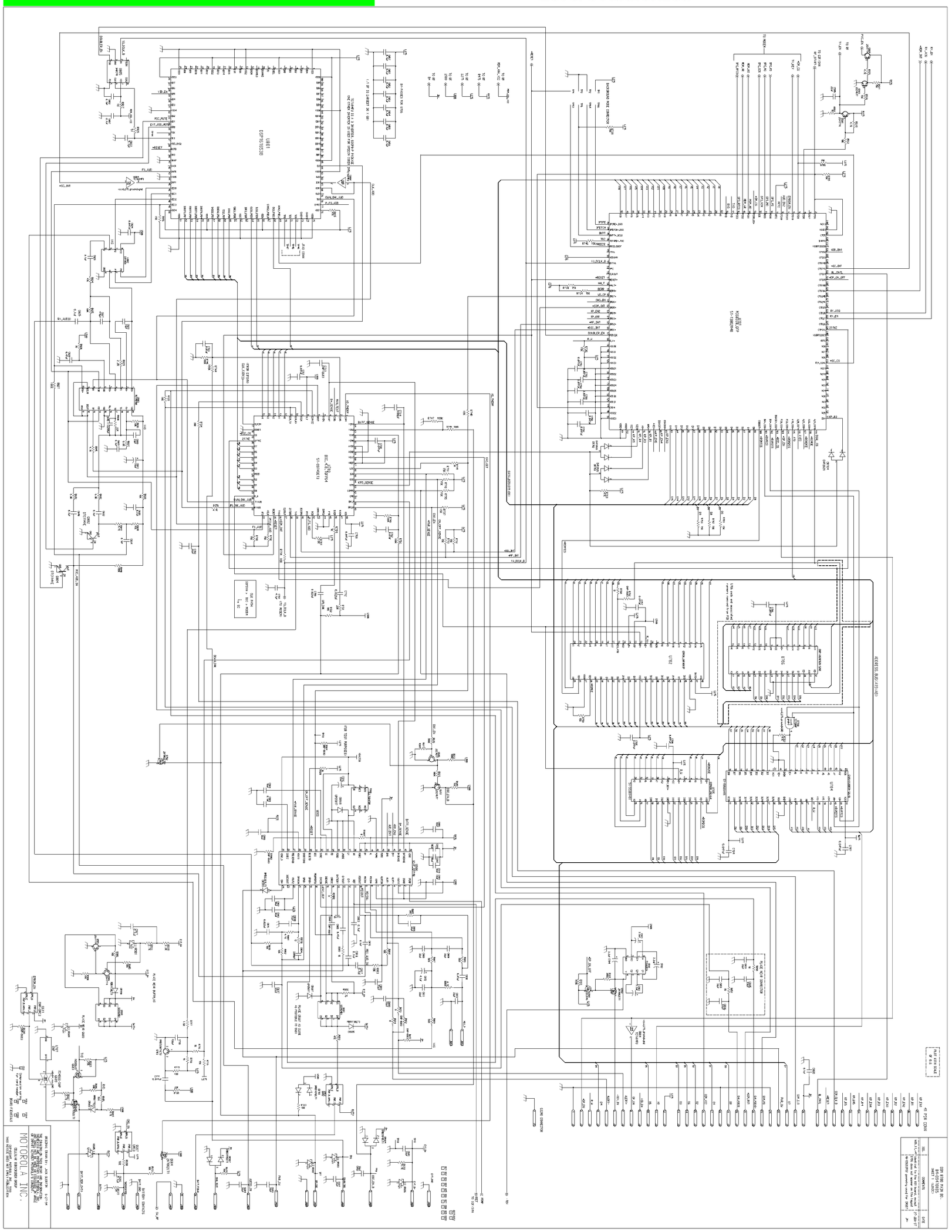
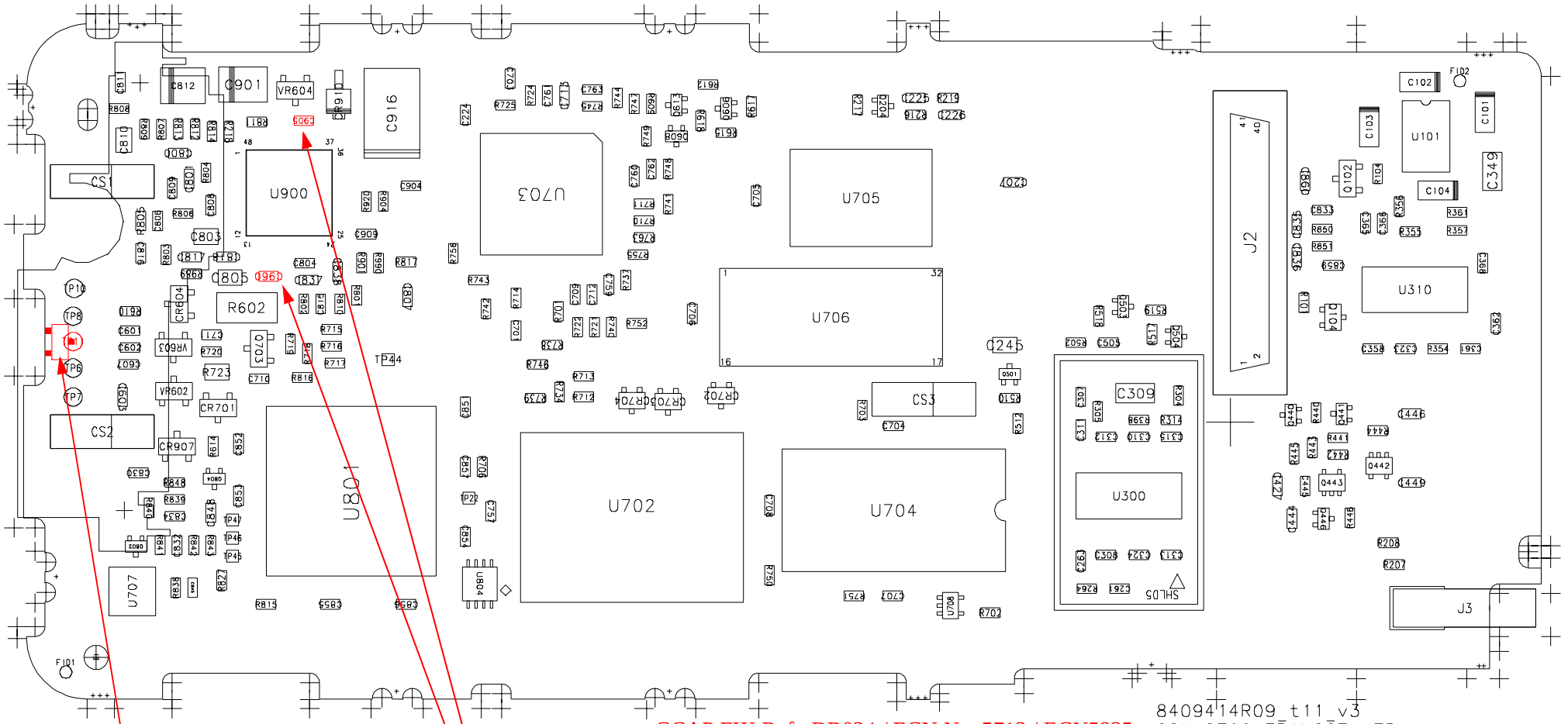
LEVEL 3 SCHEMATIC	Rev. 1.0
6700 / 8700	
Michael Hansen, Ray Collins Ralf Lorenzen	Page1





Add VR 606 (4813830M25) (Both 6700 & 8700)
pin 1 to TP11
pin 2 and 3 to GND

Remove C960 and C905

84094 14R09 t11 v3
GSM 8700 TRANSCEIVER
SCALE 4:1 DATE 16-AUG-96

GCAP FIX Ref.: DB034 / ECN No. 5713 / ECN5835
3 Pages 02 / 97
Michael Hansen - Technical Support / HTC Flensburg

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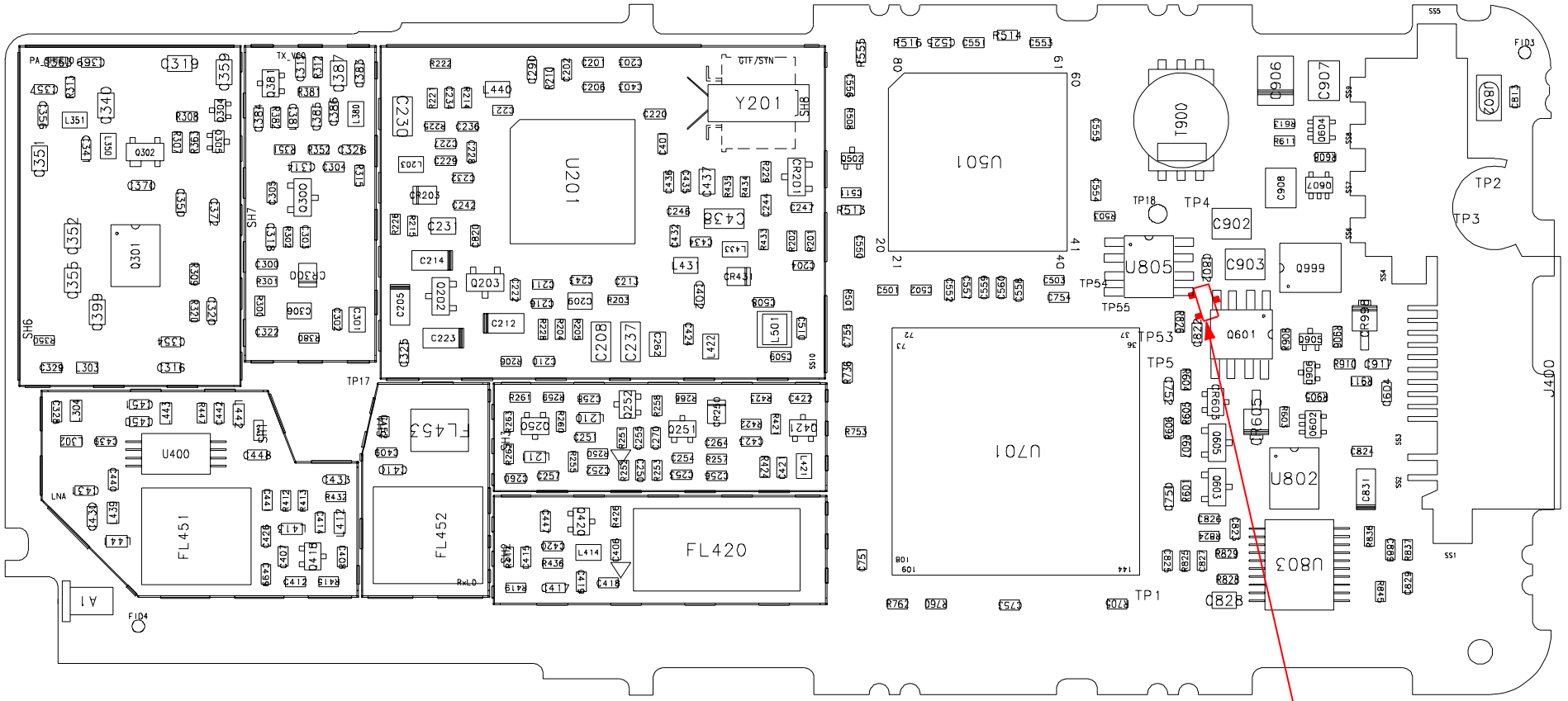

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GSM 8700 TRANSCEIVER
SCALE 4:1 DATE 16-AUG-96

GCAP FIX Ref.: DB034 / ECN No. 5713 / ECN5835
3 Pages 02 / 97
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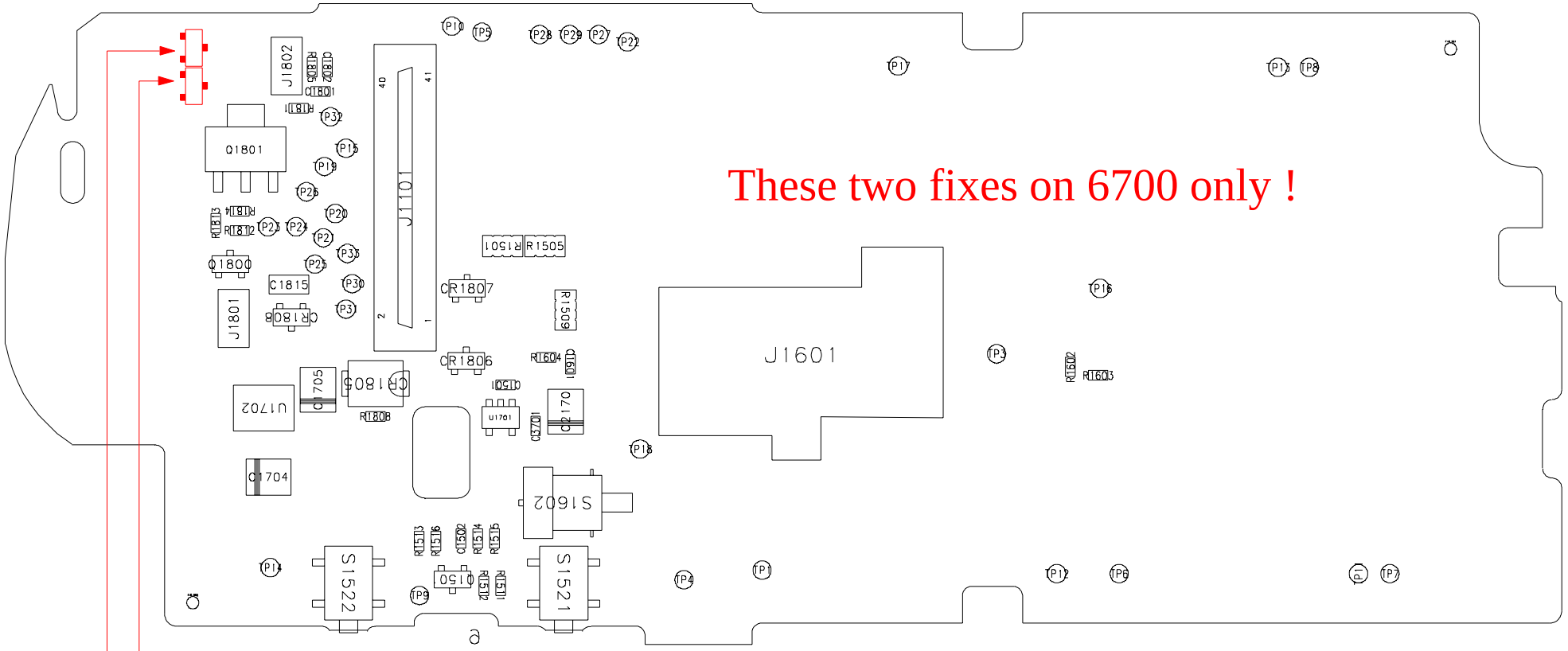
Add VR 607 (4813825A05) (Both 6700 & 8700)
pin 1 to pin 4 / Q601
pin 2 to pin 5 / U805
pin 3 to C822

High Tech. Centre - Flensburg European Cellular Subscriber Division	March 5th 1997
DRAWINGS	Rev. 1.0
GCAP - FIX	
Author : Michael Hansen / Technical Support	Page 2 of 3



Add VR 1501 (4813830M25)(Only 6700)
pin1 to LS+ (red wire), pin 2 and 3 to GND

Add VR 1502 (4813830M25)(Only 6700)
pin1 to LS- (black wire), pin 2 and 3 to GND

GCAP FIX Ref.: DB034 / ECN No. 5713 / ECN5835

3 Pages 02 / 97

Michael Hansen - Technical Support / HTC Flensburg

8409186C09_v2

SCALE 4:1 DATE: 09-OCT-9

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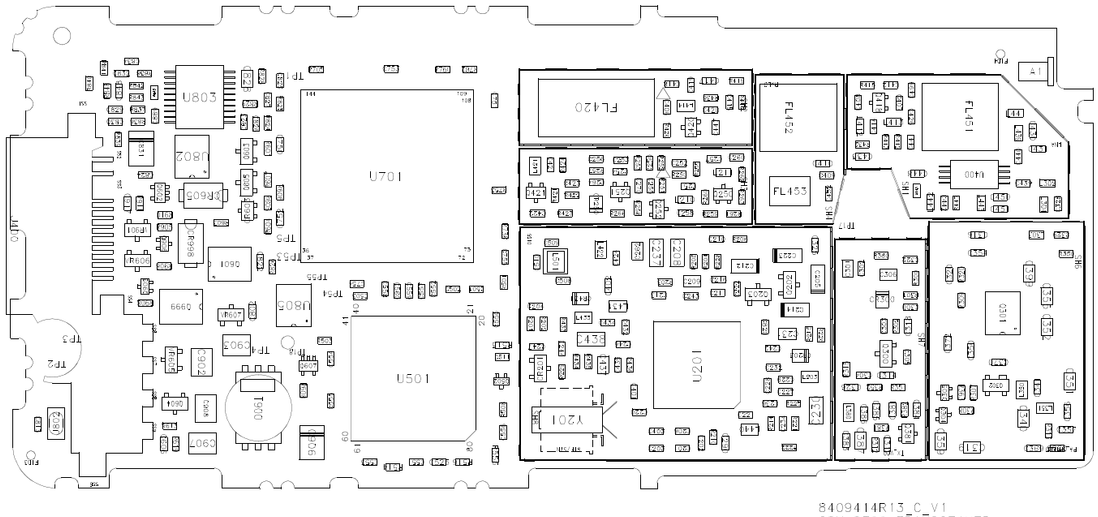
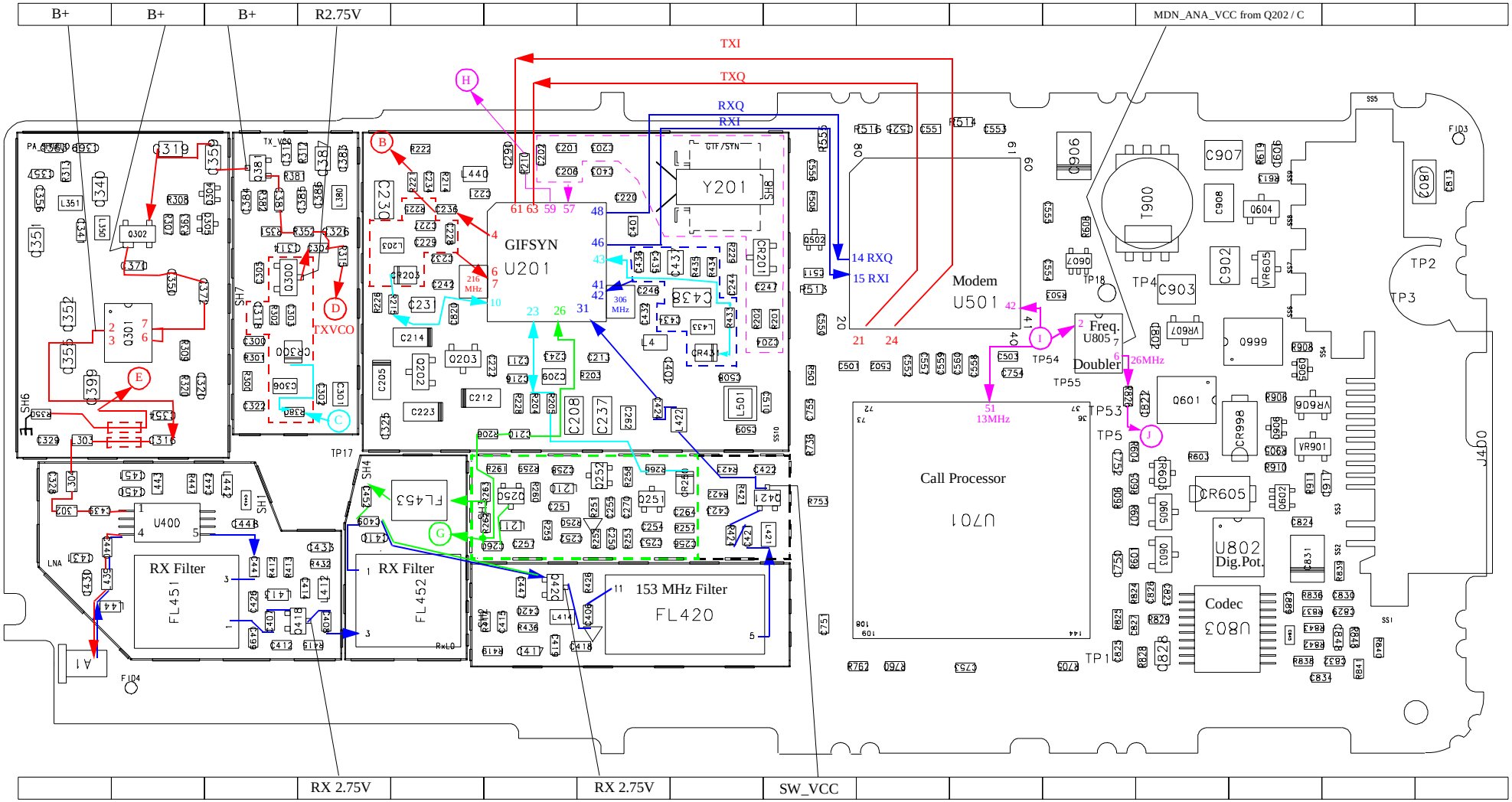
DRAWINGS	Rev. 1.0
GCAP - FIX	
Author : Michael Hansen / Technical Support	Page 3 of 3

GSM 6700 / 8700_R13





J400

1 GND	6 GND
2 EXT_B+	7 PWR_SW
3 DSC_EN_B	8 AUDIO_IN
4 DOWNLINK	9 MAN_TEST
5 UPLINK	10 BATT_FDBK

RX SIGNAL	
TX SIGNAL	
MAIN VCO	
TUNING VOLTAGES	
REF. CLOCK	

B	Tx modulated 108 MHz	G	Main VCO signal 794.4 MHz
C	TX VCO tuning voltage	H	13 MHz clock
D	TX VCO feedback 902.4 MHz	I	13 MHz clock
E	TX PA feedback 902.4 MHz	J	26 MHz clock

8409414R13_C_V1
GSM 8700 TRANSCEIVER
SCALE 4:1 DATE 15-OCT-96

High Tech. Centre - Flensburg European Cellular Subscriber Division	March 5th 1997
DRAWINGS	Rev. 1.0
6700 / 8700 - SIGNAL WAYS	
Author : Michael Hansen / Technical Support	Page 2 of 3

MOTOROLA , LIBERTYVILLE

GSM 8700

ANALYZER TEST PROCEDURE

&

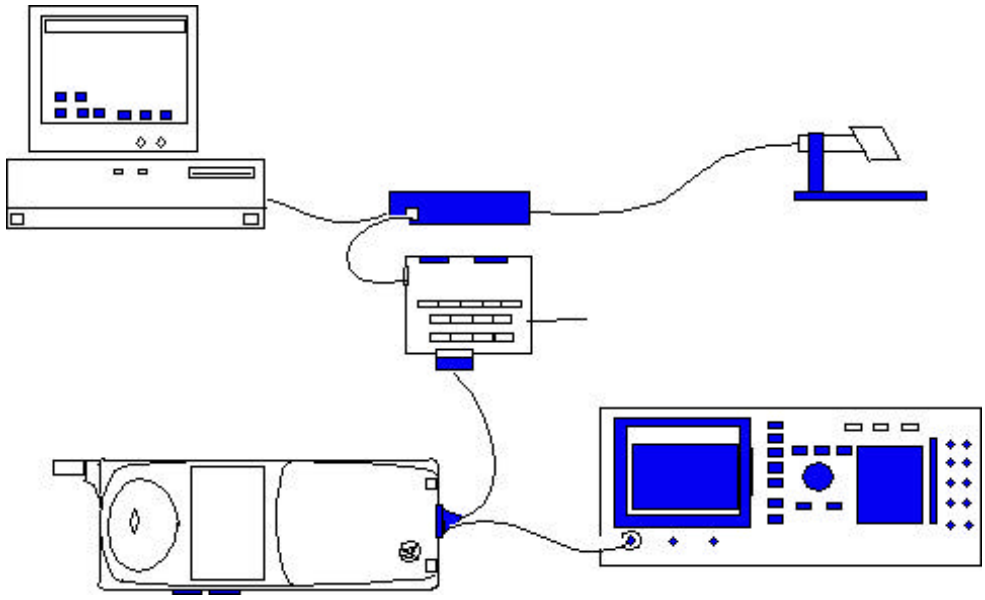
TROUBLE SHOOTING GUIDE

Oct 1, 1997 Written By : Tony Cheung

The Equipment used in this product are:

1. HP 8922H
2. Computer with Uniphase for GSM 8700

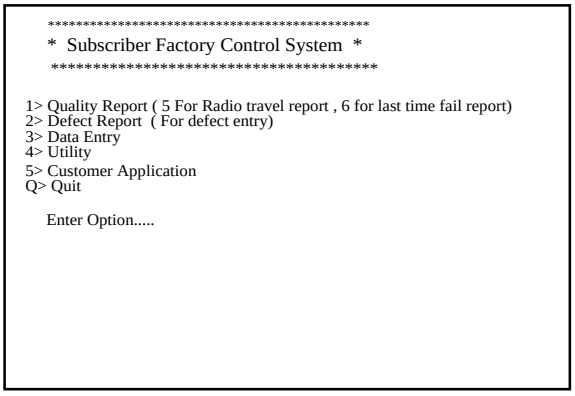
Setup For GSM 8700



Computer on GSM 8700

To Run The Radio Report and Defect Entry:

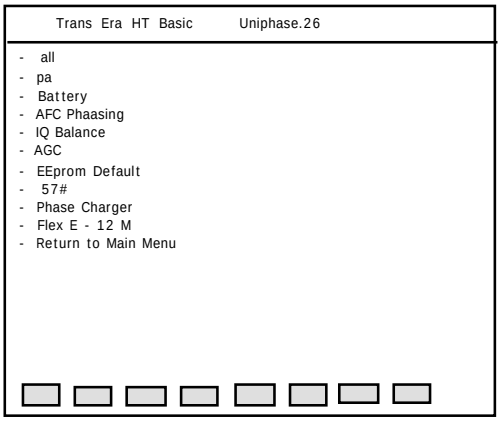
Start the computer and go to the Program Manager;
1. Click on the “PC-NFC” group icon.
2. Click the “TELNETW” program icon.
3. Connect : “Connect”
4. Go to “NETWORK”
5. Nodename: “eurosrm1”
6. Login: “analyzer”
7. The screen will show:


****
* Subscriber Factory Control System *
****
1> Quality Report (5 For Radio travel report , 6 for last time fail report)
2> Defect Report (For defect entry)
3> Data Entry
4> Utility
5> Customer Application
Q> Quit
Enter Option.....

To test the Radio by the computer:

1. Hold down the keys “Ctrl” & “ESC”.
2. Choose Program Manager
3. Click the “TranEraHT Basic Runtime” group icon.
4. Click the “ HT Basic Runtime” program icon.
5. Choose GSM and run the “Uniphase”

The Screen will be:



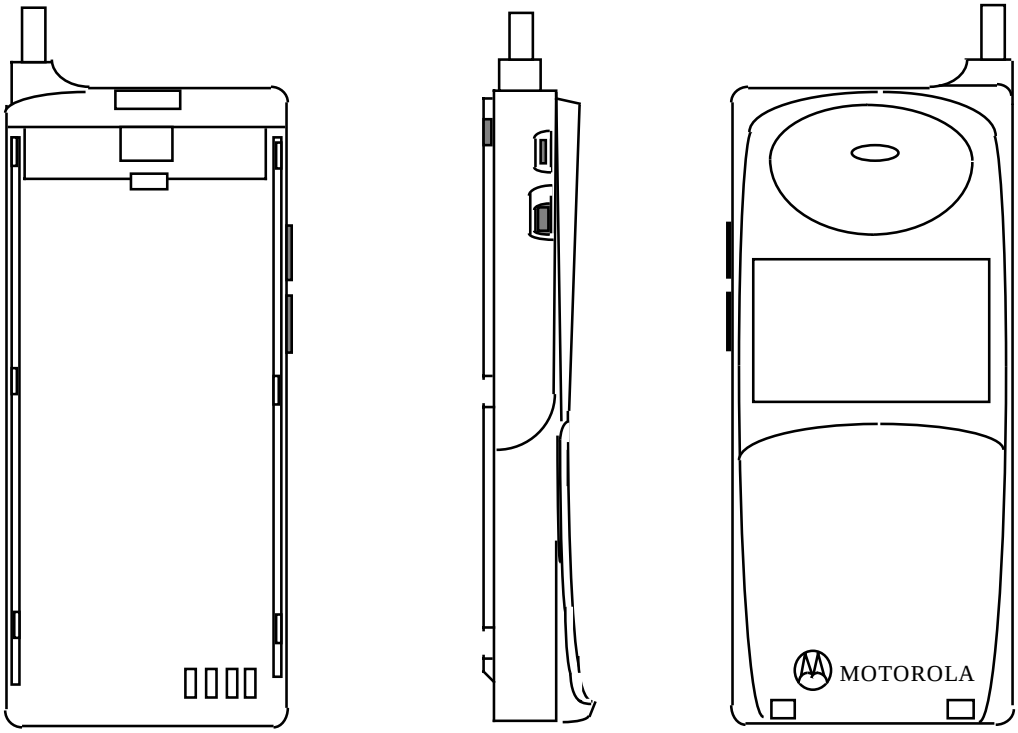
The test method refer to 8200

* You can switch back and forth by holding down the “Alt” & “Tab” keys.

Oct 1 , 1996 Written By : Tony Cheung

~~4767~~~~0~~

GSM 8700 RADIO



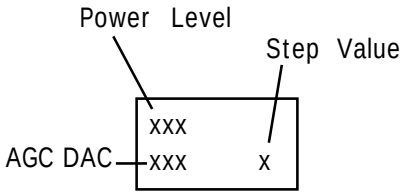
Oct 1 , 1996

Written By : Tony Cheung

Test Command:

#	Test Mode Hold down for 2 seconds
01#	Exit Test Mode
02xx#	PA Table ,(Example: 0210#, the DAC of power step 10)
07#	Mute RX Audio Path
08#	Unmute RX Audio Path
09#	Mute TX Audio Path
10#	Unmute TX Audio Path
11xxx#	Program the specified channel xxx (1 to 124)
12xx#	Set the TX power level to a fixed setting .(0 -15)
15xx#	Generate Tone (Detail refer to the Tone Definition) xx (00 - 64) examples: key in 434# (Portable); 477# (Volume);1563# The Vibrator will be “ON” then the Tone next. example : 1590# : continues vibrator, 1591# : off vibrator.
16#	Mute Tone Generator
19#	Call Processor Version Number
20#	Modem Version Number
22#	Speech Code Version Number
24x #	Set Step AGC Sets the 25 dB step AGC attenuator. (0 or 1)
25xxx #	Set Continue AGC Load the specified by xxx(0-255) into continues AGC D/A convertor. This command needed to follow the command “11xxx#”
26xxxx#	Set Continue AFC Load the value (0 - 4095) into the continuous AFC D/A convertor.
31#	Initate Pseudo Random Sequence , w/ Midamble
32#	Initiate RACH Burst Sequence
33xxx#	Simple camping . xxx is the channel number.After phased.
36#	Acoustic Loopback
37#	Stop Test
38#	Activate SIM
39#	Deactivate SIM
40#	Initiate Sending all 1’s
41#	Initiate Sending all 0’s

45# Serving Cell Power LevelThis test will report the power level in dBm and will report the last AGC DAC and setp AGC value (0 or 1)



43x# Change Audio Path

0 Handfree w/ ext. speaker 1 Alering w/Ext Spk 2 Alering w/ Transducer 3. Handset (Mobile) 4. Handset (Portable) 5. Handset (Mobile, w /Ext. speaker 6. External Mic. w /handset (mobile speaker .) 7.Handset (portable) mic w/ext. speaker. 8.External Mic. w/ handset (portable speaker)

46# Display AFC DAC
47# Set Audio Volume (0 - 7)
500xxx# Charger (xxx= 000 - 255)
51# Enable Side tone
52# Disable Side Tone .
57# Master Clear
60# Display IMEI
65# Display IMSI (International Mobile Subscriber Identity) from the SIM.

- Note : Some command may be changed for different versions.

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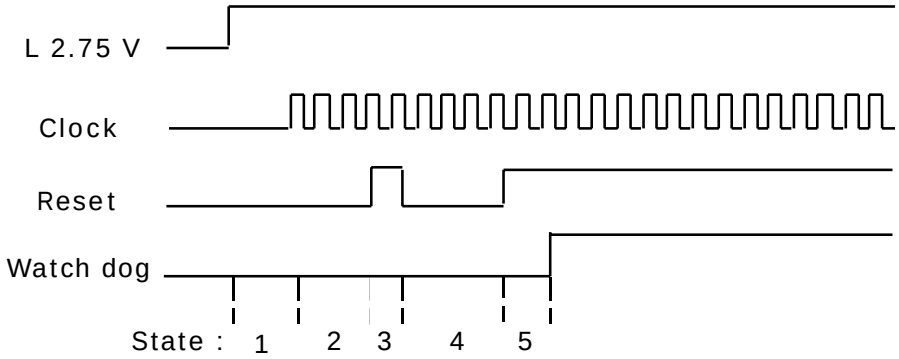
FLASH TURN ON:

To test the radio for turning on when power is supplied.
Radio power up sequency :



State 1 :When the GCAP detects a power on request (ON/OFF line "LOW"), the GCAP will activate the +4.8 V reg while driving the /RESET line low . The Microprocessor clock line will take approximately 100 ms to stabilize after power is applied.

State 2 :The Microprocessor, Speech Coder, BIC, and MODEM IC are connected to the RESET line , The norminal time RESET is held low by the DCC is approximatetely 250 mS (set by an RC connected to the REXT and CEXT pins respectively).

State 3 : When the GCAP releases *Reset , it is pulled high by an internal resistor. There is a period of approximately 500 nS when neither the GCAP or the microprocessor is asserting *Reset.

State 4 : When the Microprocessor reset control logic detects that the system *Reset line is no longer being driven , it drive it low for an additional 40.5 Micro seconds.(526 cycles)

State 5 : When the Microprocessor releases *Reset , it is pulled high by the internal resistor. All the processors in the system , include the Microprocessor , then being excution . During this state , the Microprocessor must driive the GCAP's Watchdog line high within 50 mS or the GCAP will power down the +4.8 Volt regulator.

There are 5 regulator sources provided by the GCAP U900 :

L275 : uProcessor,EEprom , Eprom ,RAM, Speech Code and BIC
R275 : PAC, TIC, TX VCO
VREF: GIF SYN
L500 : SIM ,Flash Programming and Audio Codec.
R475 : TIC, TX Synth, GIFSYN / IF Section.

Test of the Reset line :

Setup the Tektronic TDS340

- Vertical menu : DC, 1V/Div , T=100uS
- Horizotal Menu : Trigger Position 75%, 75 % pretrigger.
- Trigger Menu : Mode : auto.

Test Procedure: Plug in the Butt Plug with 7 Volt,if the board turns ON

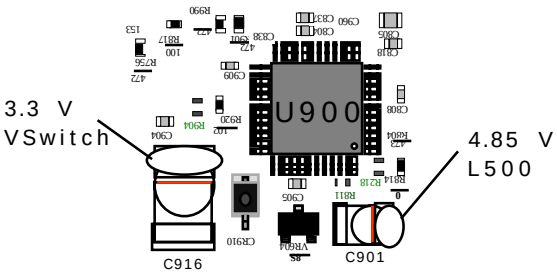
Oct 1 , 1996 Written By : Tony Cheung

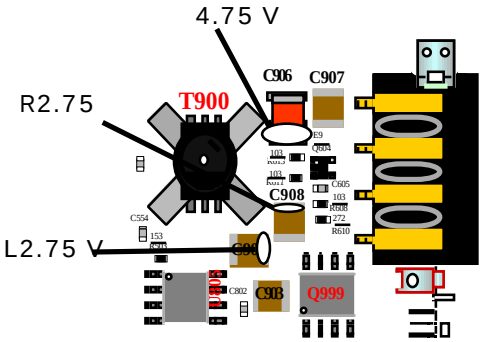
properly , it should draw about 70 to 80 mA.

Trouble Shooting: Plug in the Butt Plug with 7.5 Volt

1. - Check for 6.7 V on pin 48 of the U900 (B+)
   If there is no B+ then :
   - Check the Q999 FET switch: pins1,2 & 3 should be 6.7 V.
   - Check VREF for 2.75v on pin 11 U901
   - Check the voltage of Vswitch should be 3.3 V
   - Check the voltage on :

C901 - L500
C902 - L 2.75v
C906 - R 4.75v
C908 - R 2.75v
C916 - Vswitch 3.3 V





- Check U900 for Unsolder, Solder short and parts missing around U900.
- If no voltage is measured. Check U900-11 Vref , It may be shorted to ground.

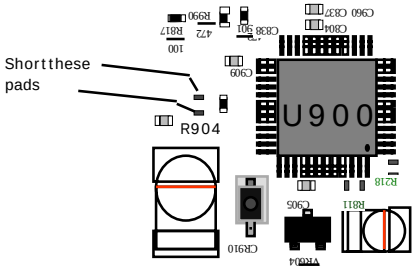
2. - Check clock in at pin 17 of U703 (13 Mhz) as --> 0.8 V RMS .

and clock out at pin 37of U703 (13Mhz) as --> 4.25 V RMS

(If there is no 13 Mhz Clock; Check Y201,CR201 and U201)

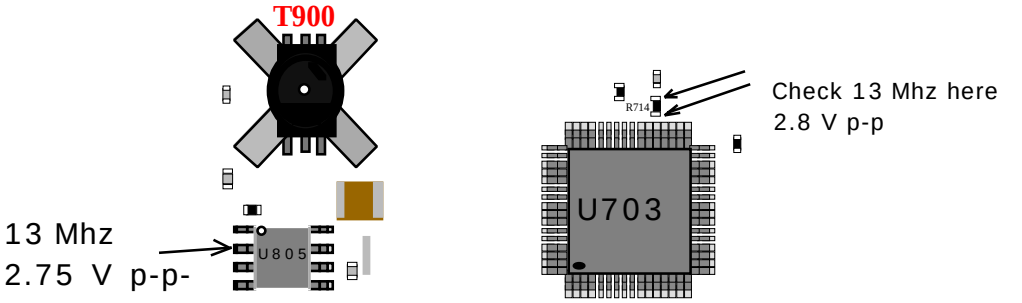
3. Check the “Watchdog at R904 (U900 -31) ,it should goes high during the

power up sequence. In order to hold the radio on, short the watch dog line to L275 as shown:



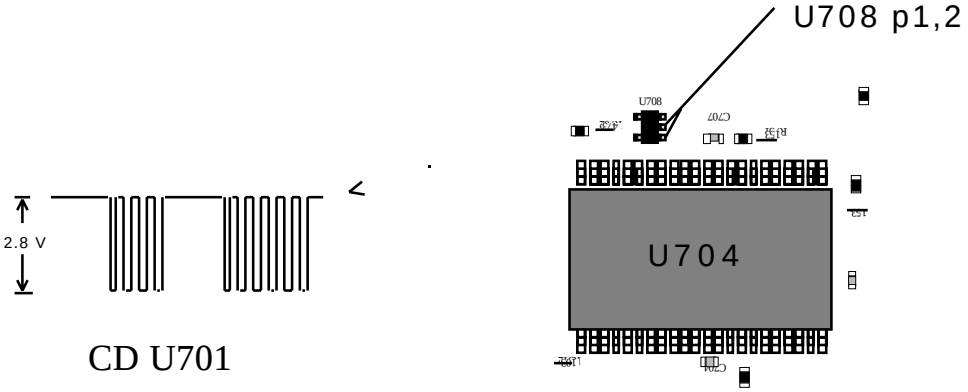
CD U701

4. Check the 13 Mhz clock signal at U805-2 and U703-37(R714):



If not : CD U702
If it is : CD U705

5. Check Chip Select(CS) at pin26 U702, it should be : CD U702
6. Examine all the data & adress waveforms
7. Check RAM CS on U704 pin 39 and 40 (U708 p 1,2)



CD U701

If the board is turning ON and is drawing the correct amount of current , but is not properly communicating with the EMMI box , check the following :

8. Check DSC_EN (J400 pin3) 4.25 V with EMMI,
3.25 V without EMMI

- Signal provide from the BIC to External Connector, It indicates to the peripheral when to turn on so that the DSC bus can be synchronized and the peripheral can be identified . This signal is buffered up to 5 Volt before being out put on the external connector. This signal is also used by the phone to determine if a DHFA is present , and if so , the state of ignition in the accessory.

9. Down Link (J400 pin 4) 4.8 V. 0.84 V p-p

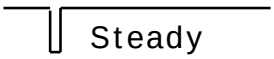
Up Link (J400 pin 5) 3.1 V , 0.72V p-p

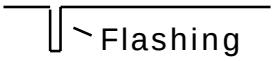
- Speech and data information from external peripherals when in DHFA mode can be transfered across the DSC bus 2- wire , full duplex connection (Uplink and Downlink) . Uplink and Downlink are also used to sense the present also a DHFA and the ignition status\ of the DHFA with DC levels.

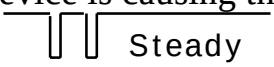
* If all the above looks good , the radio still not turning on CD U702 (The software)

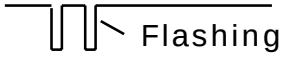
10. If the radio turn on 5 seconds then shut down:
- Go in to the Test Mode immediatly.
- Key in 1701 , it tell the fail code , usually it is a bad Modem.

Quick Check: (pull Watch Dog high)

Reset line :- One steady pulse , Bad boot code, problem between Micrpocessor and the software. 

- One flashing pulse , Unsolder on software or Microprocessor. 

- Two staedy pulse : some other device is causing the problem. 

- Two pulse with the 2nd one flashing : Bad Ram or bad software. 

CHECK SPEECH CODER / SPEECH CODER VERSION:

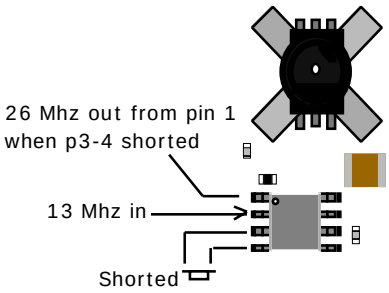
To Check the Speech Coder and its version.

Test Procedure: Key in 22#, The Speech Coder Version should be shown on the display

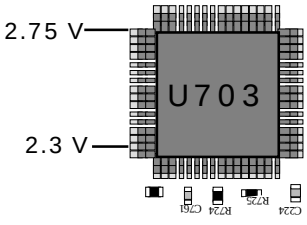
Spec.: XX.XX example : V. 11.70

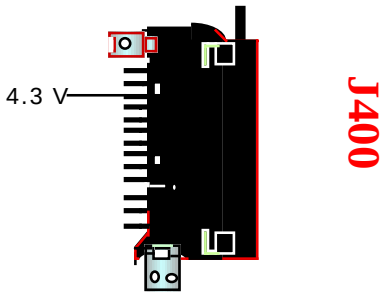
Trouble Shooting :

1. Check for Unsolder and Solder short on U801.
2. Check for 13 Mhz Clock to the frequency doubler(U805),and the 26 Mhz clock into U801 pin 37.



3. Check all data lines at U801
4. Check DSC on J400 pin3 (4.3V) and U703 pin49 &pin 63





READ VERSION ERR / PROCESSOR VERSION :

To Check the Microprocessor's Version # in the software.(702)
KEY IN 19# TO CHECK THE CALL PROCESSOR VERSION EXAMPLE : 74.05.03

Trouble Shooting :

1. Check for Unsolder and Solder short on U701
2. Wrong Software(U702).

FLEX EEPROM:

To load the default information in to the EEPROM which is :

1. Speech Coder
2. Verifiy the status of Call Processor.
3. PA Table
4. RXI & RXQ
5. Manufacture ID
6. Battery DAC
7. Pseudo ramdom byte sequence.
8. Classmark

The test bat will :

Power up the radio with battery input of 7 Volt.

- Wait for 3 seconds then set "Factory's Info"
- Turn Power Off for 1 sencod then power the radio again.
- Disble MPC Subsidy Lock Flag.
- Verify state of Battery A/D
- Enter Test Mode.

Trouble Shooting :

1. Check for Unsolder on U705
2. CD U705
3. Verify that the board did not shut off during this test. Run EEPROM

Default.

MODEM VERSION:

To Check the Modem's Version U501 using EMMI Command "RQVN"

Test Procedure: Plug in the buttplug with 7 Volt
Key in 20 #
The radio will display the Modem version .
Example : V.35.06

Trouble Shooting :Key in 20#, the Modem version should be displayed,
US/SS U501
- Check the SPI Bus & parts around U500 (The Modem comunicates with the call processor by the SPI Bus.)

READ SERIAL:

The radio factory data is being verified (The information about the previous test .)

Trouble Shooting : Check US/SS on U701
Re-tune , may be operator error.

PROGRAM SERIAL:

To store the Factory Serial # into EEPROM (Store the Scanned Barcode into EEPROM.)

Trouble Shooting : Check for Solder short, and Unsolder on U701, U703 and U705.

OFF DRAIN :

To check the current drain of the radio without turning it on .

Test Procedure:

Connect the radio with power supply #3 to the battery input .Place the DMM in series w/ the power supply. (J400 pin 11, GND pin 13, 7 V) , Read the current drain from the DMM.

Spec :0 - 0. 6 mA

Trouble Shooting:

1. Check for Solder short on the board.
2 Isolate Batt+ from B+ by removing Q999. If off drain proble still exits, then trace Batt+ to all components (Battery Charger). Check voltage on the batter charger circuitry with the board off.
3. If the Off Drain problem goes away when Q999 is removed then the problem is with B+ . With the board off check the voltage on all power supplies from U900 (GCAP). They all should be close to 0V. Also check the GIFSYN regulator (Q202, Q203).
4. Check for all voltage: Logic 5 V; Logic 2.75 V, Ref 4.75 V, Ref 2.75 V and Vref.
5. Isolate the RF Supplies to check where the Off Drain Caused.

6. If all the power supplies look good, then try to isolate B+ from parts of the board (Ohm out B+ to ground and compare to a good board).

STAND BY DRAIN:

To check the Stand By current drain of the radio by using the battery input of 7 Volts.
After the back lites are "OFF". the current of the radio should be within the specification.

Spec.: Board : 30 to 100 mA (typical : 45 mA)
Radio : 70 to 170 mA

Trouble Shooting :
Test the Radio's functions:
1. Power step 0 , 15
2. Do the pull range
3. Using computer to test the TX Pseudo
4. Check all the voltage supply for unstable voltage and ripple.
5. Verify that the receiver is working properly.
6. Connect a front hiusing and check backlites, display, and keypad functions.

TEST MODE :

Set Up : 7 V

Test bench puts radio into Test Mode . It is rare to have this failure . If it does, It may be caused by a software problem or bad connection.

Trouble Shooting:

1. Press "#" for 2 seconds to check if "TEST" show up on the display.
2. Check Unsoder on U701 , U703 and U705
3. Check for Unsolder on External Connector
4. Check for parts missing on the front housing.

Note : Once the radio has passed phasing , it will not go into Test Mode without a SimCard.

POWER STEP 0 LOW CH :

The Test Bay will :

Power up the board with 8V on the battery connector.

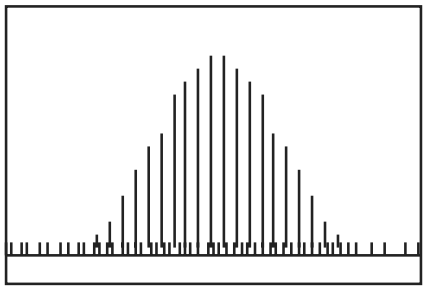
1. Set AFC DAC to 2340
2. Select Channel 1
3. Perform Pseudo Test with power level “15” (13 dBm) and midamble 0.
4. Measure the avergae current . 290 mA to 400 mA.
   (If the current is no match the spec. It fail the test.)
5. Measure the frequency to within +- 10 Khz.
6. Set the power level “0” (31 dBm)
7. Select channel 124 and repeat the test as above.
   - Verify the above measurement are within specification.

Spec : 26 to 36 dBm

Test Procedure :

1. Power up the radio with the Batt connector of 8 Volt.
2. Using Uniphase -TX Pseudo function set channel 1 power step 0.
   (This sets the radio up to transmit at low channel (1) at max. power)
   You should see this on your HP8922H :

Center Frequency : 890.2Mhz
Span : 1 Mhz
Ref Level : 42 dBm

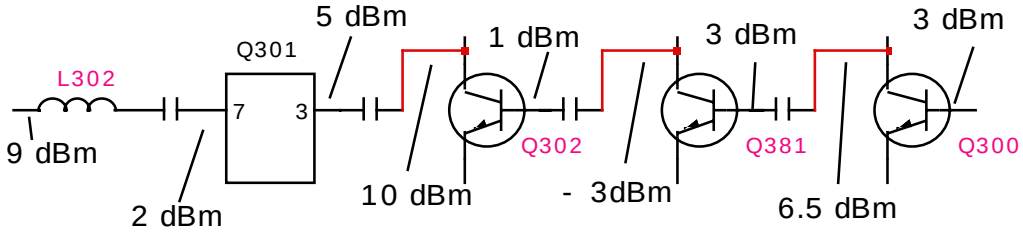


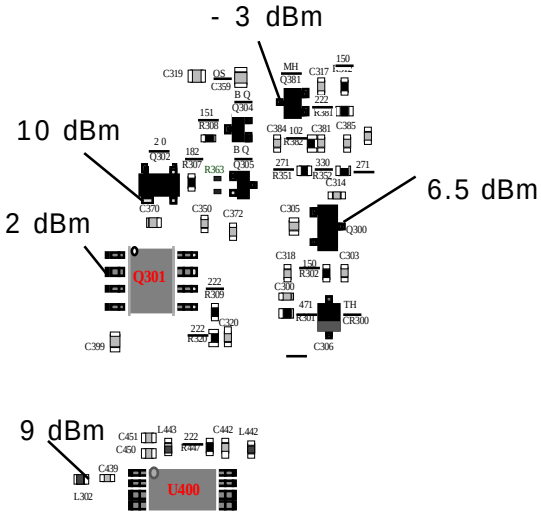
- The current drain at Max Power should burst to about 470 mA.
  (On power supply #1 w/Butt Plug)

Trouble Shooting :

1. Setup the HP8922 to Cell Cntl - Spec Anal.[Sweep .5 Sec, Max Hold]
2. Key in 11001#, 1201# , 310# or TX Pseudo in Uniphase.
3. Verify the wave form and observe the peak power and compare with the good broad.
4. If there is no TX at all , then check the 890.2 Mhz at the PA . on the collector of Q302 . you should see about 13-15 dBm. If signal is there, but not the correct amplitude , trouble shoot the PA as below:

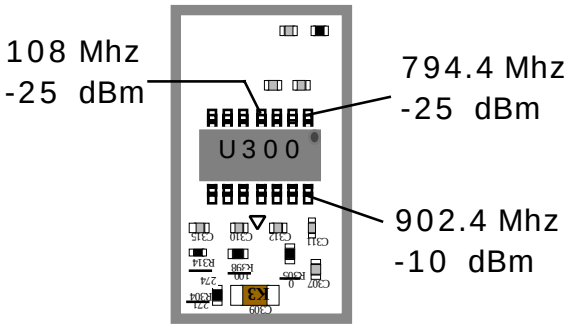
(Due to the signal is in pulsing mode,it is a little difficult to get the actual reading,Slow sweep time on spectrum analyzer down to 2 Sec. and use above TX Seudo function (or 11001#, 1200#, 310#)





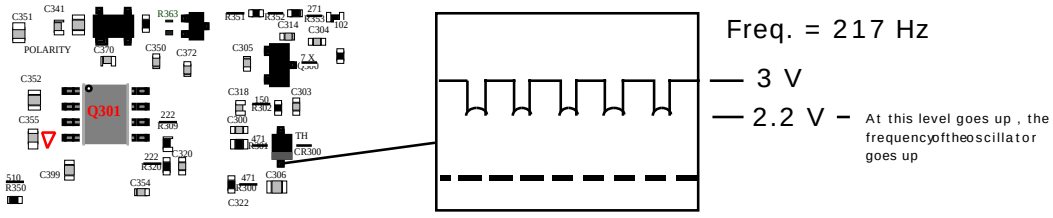
If there is no signal at the Base of the Exciter Q381:

5. Check : RX VCO input at U300 p1
IF Input at U300 p4
TX VCO input at U300 p14 as shown :



-If the frequence are funcky , check SS U701 pin 2,3

- If there is no RX VCO : trouble shoot the RX VCO circuit (refer to the Mac Trouble Shooting Guide)
- If there is no 108 Mhz from U201 p4, then check if the following things are working .
  - TX I & Q from U501 (U201 pins 61,62,63 and 64)
  - 216 Mhz LO
  - IQ filter (C221, L440)
- If the RX VCO and 108 Mhz are both bad. there may be a problem with the GIF SYN regulators (Q202, Q203) or with the 13 Mhz crystal oscillator circuit (Y201) controled by U501 p29.
- If the RX VCO and IF are both good then the problem is most likely in the TX VCO .This VCO is controled by U300 p8 and is always locked 108 Mhz above the RX VCO frequency. This act like a phase lock loop circuit.CR300 controls the frequency of oscillation . In normal peration at TX Max. Low channel , the signal on CR300 should look like this :



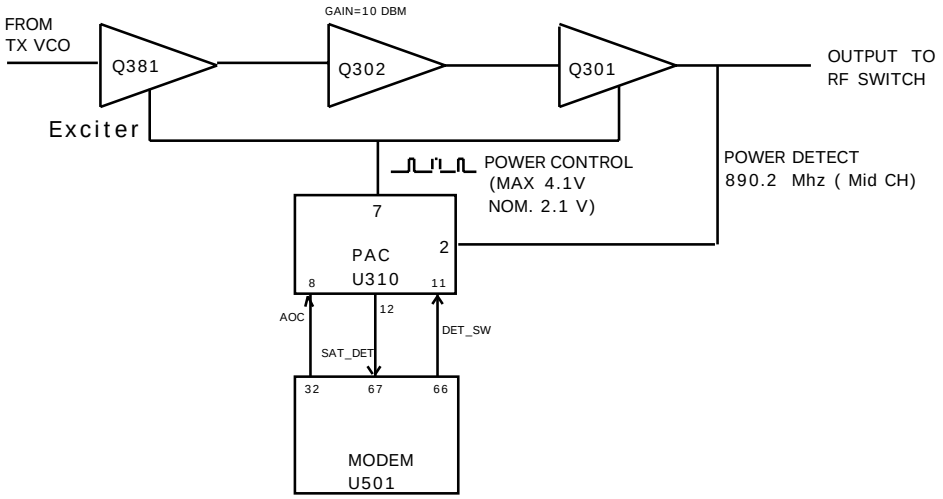
6. If the radio turns off when the transmitter is on, check the path from U500 to U310 pins 9,10,11 and 12. CD U310, CD U200 .

7. If no gain on Q381 & Q301 , then check L501 -AOC line (Q302 gain should be constant)

PA Control Operation :

Measurement taken with the spectrum analyzer vary a great deal in the PA circuit depending on exactly where the measurement is taken and what type of probe and RF cable is used . Because of this , we recomend taking readings from a good board and comparing.

See Block Diagram:



The PA is made up of 3 parts (Q381,Q302, Q301) 2 of which are variable gain and 1 that is constant gain. B+ is used to power all 3 parts of the PA. (Collectors of Q381 & Q302 and drain of Q301). The biasing for the PA is provided by the PA control IC (PAC).

* Q302 is set up as the constant gain portion of the pA with its biasing being control through Q304 and biasing voltage on the Base of Q381 and on the Gates of Q301 , therefore increasing the gain of the PA.

U310 (PAC) also commuicates with U501 (MODEM) using the AOC , DET_SW, and SAT-DET lines . These lines are used to let the Modem know when the PA has gone into saturation . When satuation occurs , the Modem can adjust it's AOC line to control the PAC's output PA biasing voltage . For more information on these 3 lines , see the GSM /8700 interface document (pages 9 &10)Q305 , this portion has a gain ~= 10 dBm.

TX CURRENT LOW CH :

Power up the radio from the Battery Input of 8 Volt.
The Test Bay will :
1. Set AFC DAC to 4092
2. Set channel to 1
3. Set the power level to “0”
4. Perform the Pseudo test with midamble “0”

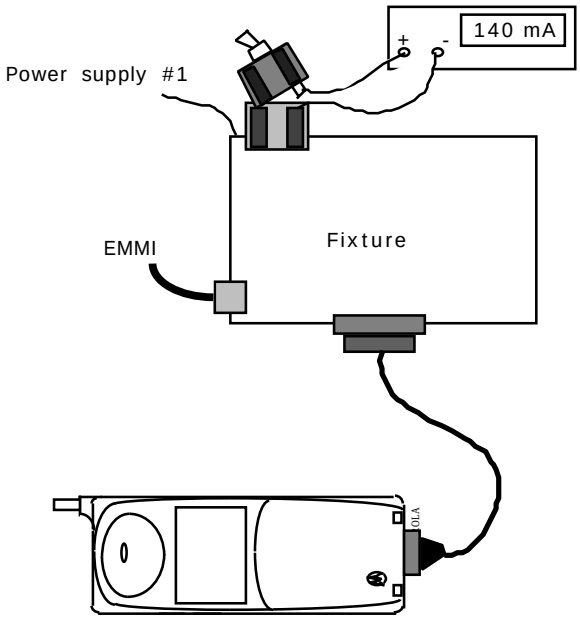
- The frequency should be within +- 10 Khz
- The current should be within 100 mA to 220 mA
- The TX Power should be 28 dBm to 33 dBm.
  (The PA table set the power level 0 approximate to 30 dBm)

Spec : 100 - 220 mA

Test Procedure: Due to the HP6623 A Power Supply not responding to pulsing current, we have to read the current from the DMM. Do the set up as below:

This set up only for the benches with the old interface fixture.

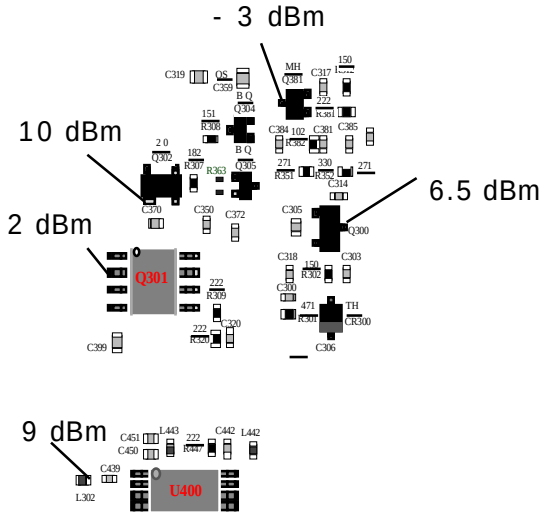
If you use the battery supply , then you don’t need this setup.

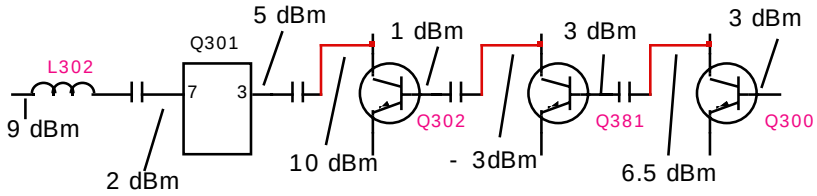


1. Power up the radio with the Batt connector W/PS#3 of 8V .
2. Key in 11001#, 1200#, 310#
3. Read the TX Power on the HP8922H. It should be within 28 - 33 dBm (typical : 30 dBm).
4. Read the current on the DMM , it should be within 100 to 400 mA. (typical : 140 mA)

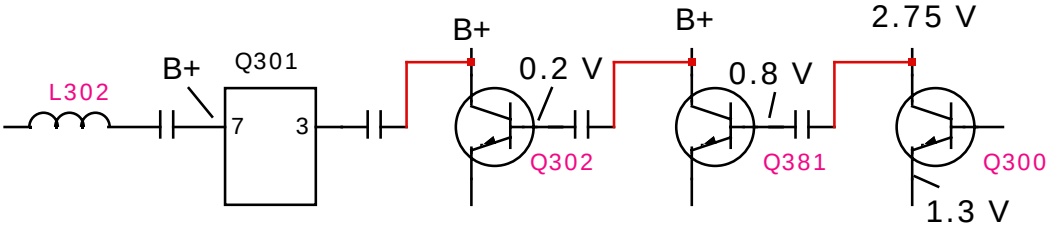
Trouble Shooting :

1. If the TX Power is low on power level 0 , check the path for power loss as below :





2. If the current is off specification, Check the voltage as below:



TX current is almost always caused by a power control problem. usually because the gain of the PA is turned up to high causing excessive current drain. Look at the power control biasing on the gates of the PA Q301 . If the control voltage is to high then the radio may transmit at the proper level , but could be drawing too much current . Compare this control voltage to a good board , if it is too high then there is a slight loss in TX path somewhere, or a problem with the power detect/control circuitry around U310.

See PA Control Operation in Power Step o Procedure.

Oct 1 , 1996 Written By : Tony Cheung

TX FREQUENCY LOW CH Fc/F1/F2 :

In this test ,The test bay will :

1. Set AFC DAC to 2340 (Fc)
2. Set channel to 1
3. Set power level to "0" (The PA Table for power level "0" is pproximately 30 dBm)
4. Perform Pseudo test with midamble 0
   - Read the frequency as Fc
5. Stop the TX transmition.
6. Set AFC DAC to 0 (F1)
7. Do the same test as above
   - Read the frequency as F1
8. Set the AFC DAC to 4092 (F2)
9. Do the same test as above
   - Read the frequency as F2

- The Fequency for :
  - Fc should be 890.2 +- 100 Khz
  - F1 (Offset frequency) -22.6 Khz to - 100 Khz
  - F2 (Offset frequency) 22.6 Khz to 100 Khz

Test Procedure :

1. Set HP8922H : Cell Control -> Test Mode -> CW-Meas -> Ch1 ->
   -> CWFreqerror.
2. Power up the radio with Battery connector of 7 Volt.
3. Key in :11001# (Low channel)
   1215 # (TX Power level 15)
   262340# (AFC DAC ,mid range)
   40 # (Continue sending all 1's)
   Read the frequency error plus 67 Khz as Fc (Because we use 40# send out all 1's [67 Khz above the frequency])
4. Key in 37# (Clear)
   260000# (AFC DAC, low range)
   40#
   Read the frequency error plus 67 Khz as F1 , it should be < -27.07 Khz (more negative)
5. Key in 37#
   264092 #
   40#
   Read the frequency error plus 67 Khz as F2 , it should be > 27.07 Khz

(Compare these reading with the Uniphase by AFC Phasing . You can do this by Uniphse AFC Phasing.)

Trouble Shooting : Same as " Pull Range "

TX FREQ. PULL RANGE :

To check the AFC circuit whether the frequency can be pulled to a certain range.

The Test Bay will do the following:

1. Power up the radio with the Battery Input of 7 volt.
2. Set the TX Power to level “0” (31dBm)
3. Set AFC DAC to 2340
4. Select channel “1”
5. Perform Pseudo Test with midamble 0.
   - Current on this test should be within spec. (290 - 400 mA).
6. Read the frequency as Fc
7. Set the power supply to 7 Volt.
8. Set AFC DAC to 0
9. Do the same test as above.
10. Read the frequency as F1
11. Stop the transmiter.
12. Set AFC DAC to 4092.
13. Do the same test as above.
14. Read the frequency as F2
15. Verify AFC pulling range (F2 - F1) is within the spec.

Spec. : =< 180 Khz

Test procedure :

1. Power up the radio with the Battery Input of 7 volt.
2. Set the HP 8922H to Spec. Analyzer with center frequency of 890.20 Mhz , span 2 Mhz.
3. Key in : 11001 #, 1210 # , 260000 #, 40 #
4. Read the frequency on HP8922H as Fa
5. Key in 37# (Clear), 264092#, 40 #
6. Read the frequency as Fb.

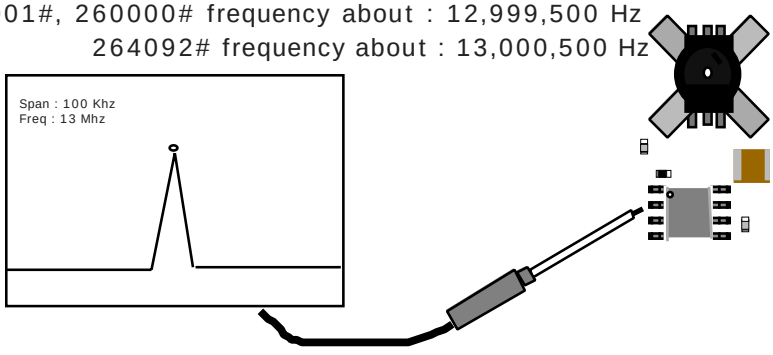
   Pull range = Fb - Fa

   Spec. : =< 180 Khz.

Trouble Shooting :

1. Check the 13 Mhz by the Spectrum Analyzer as shown below:

Key in 11001#, 260000# frequency about : 12,999,500 Hz
264092# frequency about : 13,000,500 Hz



2. Check the AFC voltage from U501-29, this change in voltage creates the change in frequency.
3. Check for Wrong parts C247, C203
4. CD CR201 or Y201

RX LEVEL 0 BAND 1 :

To phase the RX _ IQ and AFC in the Receive circuit on band 1 by using an equation for calculation.

Spec.: -70 to -50 dBm

The Test Bay will :

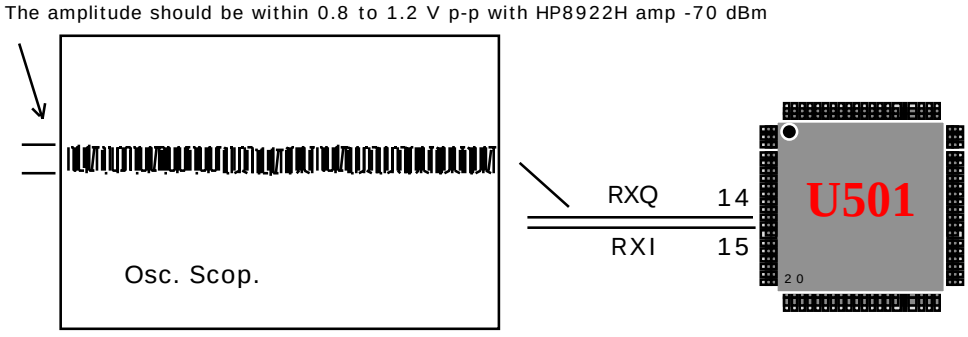
1. Power up the radio with the Battery Input of 7 volt.
2. Set the radio to Test Mode .
3. Set the HP8922H to Test Mode -> “Broadcast Channel Only” - > -> Channel “1” -> Amp “ -50 dBm”
4. Unmute the RX Path
5. Select Channel “1”
6. Measure the amplitude of RXI and RXQ
7. Decrease the Amp on HP8922H to -70 dBm
8. Measure the amplitude of RXI and RXQ

Spec. : -50 dBm to -70 dBm

(RXI/RXQ should be within 0.8 to 1.2 V p-p)

Test Procedure:

1. Power up the radio with the Battery Input of 7 volt.
2. Set the radio to Test Mode .
3. Set the HP8922H to Test Mode -> “Broadcast Channel Only” - > -> Channel “1” -> Amp “ -50 dBm”
4. Key in 08# (Unmute the RX Path), 11001# (Channel 1)
5. Measure the amplitude of RXI and RXQ on U501 pins 14 and 15 as shown.
6. Decrease the Amp on HP8922H to -70 dBm
7. Measure the amplitude of RXI and RXQ as shown:

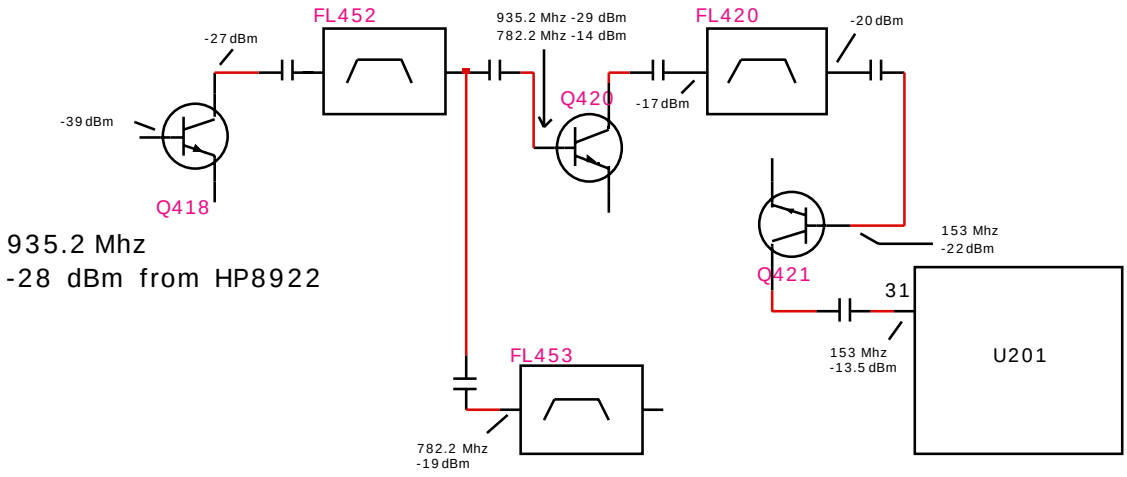


Oct 1 , 1996 Written By : Tony Cheung

- Using F3 in Uniphase will activate the receiver at low channel and set the RF generator level to -70 dBm.
- Running the IQ Balance test will simulate the test bench.

Trouble Shooting:

1. Set the HP8922H on Test Mode with amplitude -28 dBm on Channel 1
2. Power up the radio with the Battery connector of 7 Volt.
3. Key in 08#, 11001# or F3 in Uniphase.
4. Check the RX Path as shown :



SIM CARD CHECK :

To verify that the radio is properly communicating with the SIM Card.

Test Procedure :

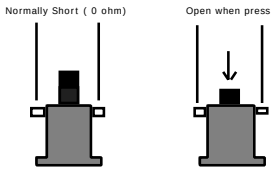
1. Power up the radio with the Battery input of 7 Volt.
2. Wait for the message of " Insert Card "
3. Insert the SIM Card , it should go to the search mode.

Spec.:10

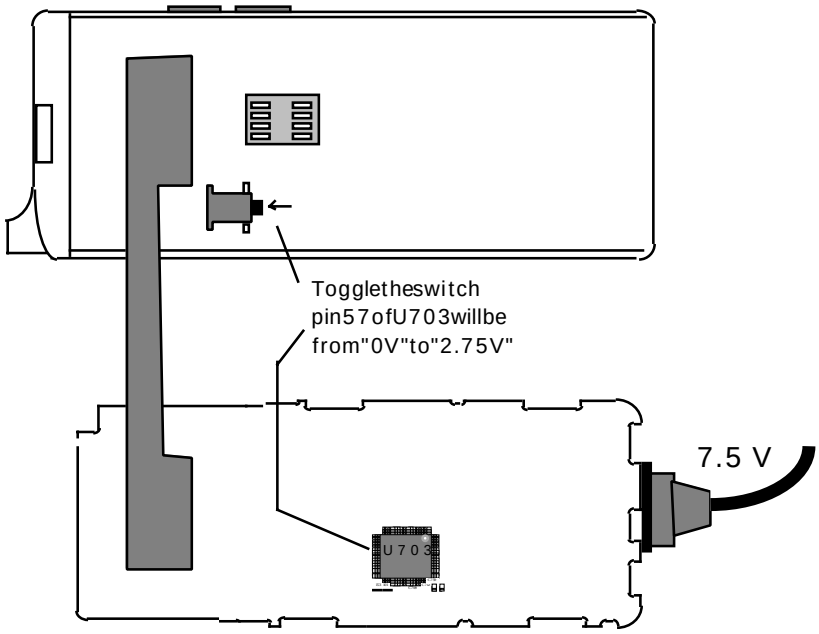
Trouble Shooting:

Many "SIM Card Chk" are caused by the process, the operator not inserting the SIM Card all the way in to the radio.

1. Check the SIM Card Block J1601 for unsolder or bent pins.
2. Check the present switch S1602



3. Connect the board to the front housing with the flex cable ,



3. Check U703 for US,SS or CD U703
4. Inspect SIM block for damaged or unsolder connections.
5. If the display reads “INSERT CARD” then check the present detect switch (S1602). When the card is inserted ,the switch opens placing a high on the SIM_PD line (2.75V).

Main Board Problem :

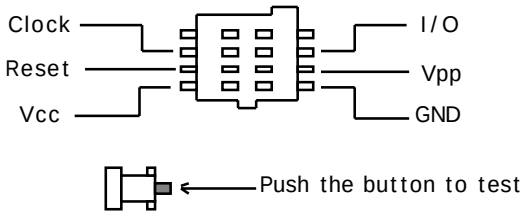
- Check SIM _VCC at U703-7 for 4.8 Volt (Card must be inserted.)
- Check SIM_CLK at U703-9 for 3.25 Mhz.
- Check SIM_I_O at U703 -10,11 - this line is used to both transmit and receive data between the BIC and the card at the time the card is inserted or when the radio is powered up w/ the card inserted.
- Check SIM_RST - this line in high when the SIM CARD is inserted and is communicating properly with the radio.

  * Trace all of these sigals from the BIC (U703) to the J2 connector.

Key Board Problem :

- If the display read “Check Card “ then present detect is working and the problem is in the card reader circuit . Check SIM_VCC at C2170 for 5 V (Check w/card inserted) . If VCC is bad , then trace back to U1701 and then to J1101. If the VCC is good then trace the following lines from J1101 to the SIM block : SIM_RST, SIM_CLK_B, SIM_I_O.

Quick Check:



1. Clock - Clock (U703 - P9)
2. Reset (U703-P6)
3. Vcc/ Vpp (U703-P7)
4. I/O (U703-P10,11)

Oct 1 , 1996 Written By : Tony Cheung

BACK LITE CHECK :

To Check the current drain of the Back Lite circuitry..

Test Procedure:

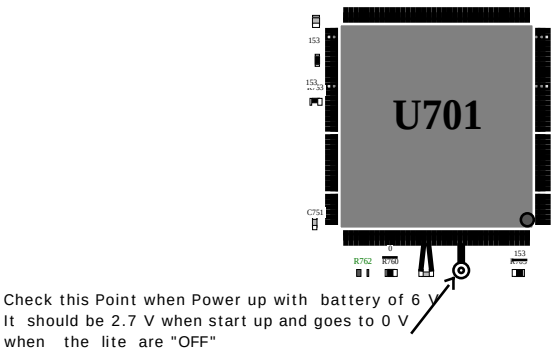
1. Power up the radio with the battery input of 7 Volt from power suplly #3.
2. The current reading of the power supply #3 should be about 100 - 110 mA , Record this current as REF 1
3. Wait for 5 seconds until the back lites are off.
4. Read the current on the power supply #3 should be about 40 to 60 mA , Record this current as REF 2

The current of the Back Lite ≅ REF 1 - REF 2

Spec. : 30 to 85 mA

Trouble Shooting :

- Check all the Back Lite are “ON”
- Compare the brightness with a good board.
- If the problem is board related:
  Check U701 ,pin 32 should be 2.75 V, when you power up the radio with the battery input and goes to 0 V after 12 seconds. (CD U701)
- If the Back Lite Enable line (U701-32) does not go high when the radio power up, then there is most likely a software problem , try reprogramming the EEPROM defaults.



- If it is housing related check for reversed LED.

- If U701-32 stay low but not Solder short. Re- tune the radio.

Oct 1 , 1996 Written By : Tony Cheung

VIBRATOR CHECK :

The test bay enables vibrator using keystrokes command 1590# and verify that the increase in B+ current is within specification .

Disable vibrator using EMMI key strokes command 1590#

Spec: 30 to 75 mA

Test Procedure :

1. Power up the radio with the Battery Input of 7 Volt.
2. Go to Test Mode .
3. Read the current drain of the radio as A1
4. Key in 1558# to enable the vibrator
5. Read the current drain of the radio as A2

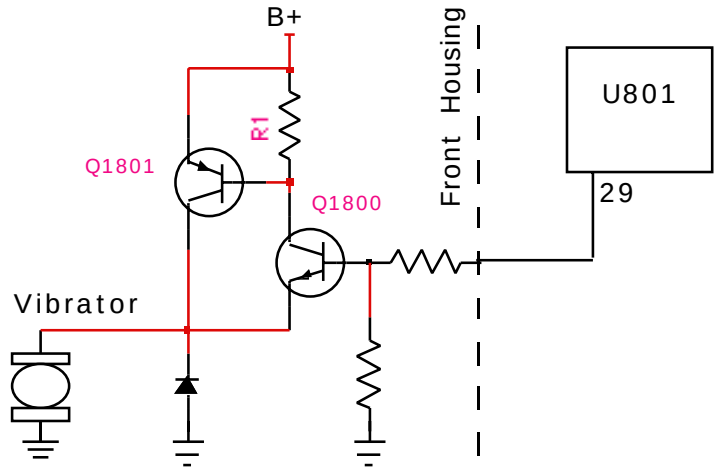
The current drain of the vibrator = A2 - A1

Spec: Tune Power Band 1 23 -31

DAC Power Band x 100- 138

Trouble Shooting :

1. Key in 1590#
2. Check U801 - 29 should be "High" 2.75 V.
3. If you don't see the 2.75 V. Disconnect the housing, use the computer to put the radio to Test Mode, then on "Key Stroke" command enter 1590# to check the 2.75 Volt on U801 - 29 again .
   If no 2.75 V, Check for US,SS on U801, CD U801
4. If the problem came from the housing , Check WP Q1800 and Q1801.



5. Check the voltage on the collector os Q1801 = 1.1 Volt, when the vibrator is "ON" (0V when "OFF").
6. Trace voltage enable back to the Base of Q1800 . verify that the VIB_MOT line from J1101 is going high every few seconds to activate the vibrator circuit. Trace this line back to VIB_EN to U801-29 If the VIB_EN line is not toggling ON/OFF , then there could be a software

problem. Try reprogramming the EEPROM defaults.

POWER PHASE INIT :

To set AFC DAC bu using Load AFC DAC EMMI Command.
The Test Bay set the AFC DAC to 2340 , then test the power in differnt step.
spec : 0

TUNE POWER STEP 0,1,2,13,14 & 15 :

The Test Bay Set the TX Power using Set PA Power Level EMMI Command
"STPA"+ "0F" (Step 15)
"0E" (Step 14)
"0D"(Step 13)
"02" (Step 2)
"01" (Step 1)
"00" (Step 0)

Initate pulse carrier with pseudo random data with midamble 0 on Ch 62.
The TX Power should be within Specification :
Step 15 : 13 +- 4 dBm
Step 14 : 18 +- 4 dBm
Step 13 : 23 +- 4 dBm
Step 2 : 23 +- 4 dBm
Step 1 : 27 +- 4 dBm
Step 0 : 32 +- 4 dBm

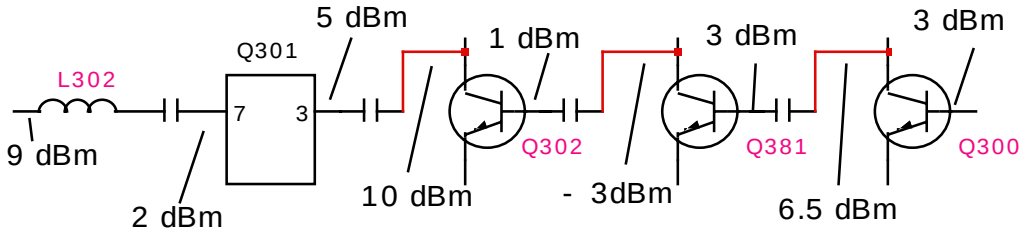
Test Procedure:(Usually the cable loss about 2 dBm)

1. Set radio to Test Mode with Battery Input of 7 V.
2. Take the RF reading through a Gizmo at the antena pin.
3. Key in 11062#m 1215#(set desired power level 0-15),310#
4. Read the TX Power on HP 8922H, it should be within the Spec.

Do the same test for other Power Level.

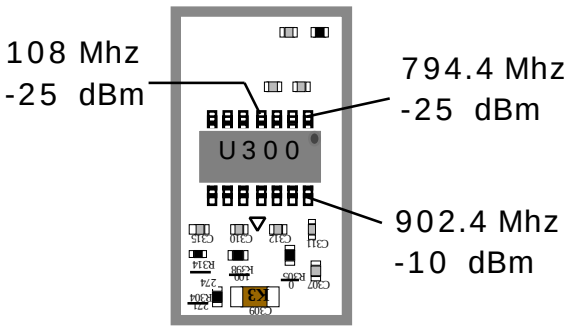
Trouble Shooting :

- If The TX Power is off Specification :
  - Key in 11062#, 1215# , 40# and check the path as shown:



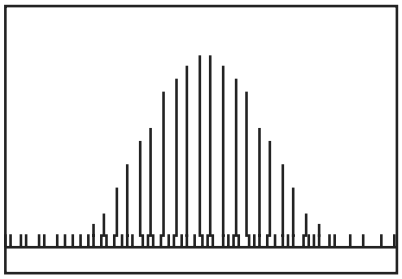
See Power Step 0 Procedure PA Control Operation.

- If no TX Power at all , Check U300 for 108 Mhz, 794.4 Mhz and 902.4 Mhz as Shown :



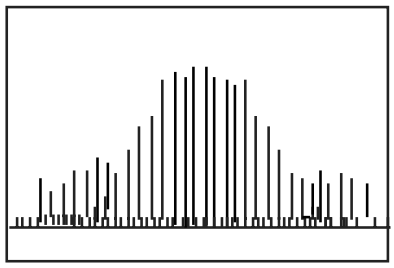
- If the above looks good, but fail for Power Step 0 (Max Power)
  1. Key in 11062# , 1201#, 310#
  2. You should see this on HP8922H -> Anl:

Center Frequency : 902.4 Mhz
Span : 1 Mhz
Ref Level : 42 dBm



Check the TX Power on HP8922H -> Active Cell -> Ch 62 -> TX Power :01 . It should be within 27 +4 dBm
(The Cable loss about 2.5 dBm)

  3. If you see this :



Check negative supply for ripple .

TUNE POWER BAND X / DAC POWER BAND X :

This test check the radio's frequency variation . where x is the band.

Band 1 : Channel 1
Band 1.5 : Channel 37
Band 2.5 : Channel 87
Band 3 : Channel 124

The Test Bay will do :

1. Set TX Power to level 1
2. Set the channel to x
3. Initiate pulse carrier with pseudo random data midamble 0.
4. Measure the TX Power
5. Calculate offset value of different channel by using equations.
6. Store the 4 frequency Offset values, 16 Power level, 2 detector offset values,power range threshold and final step in EEPROM.

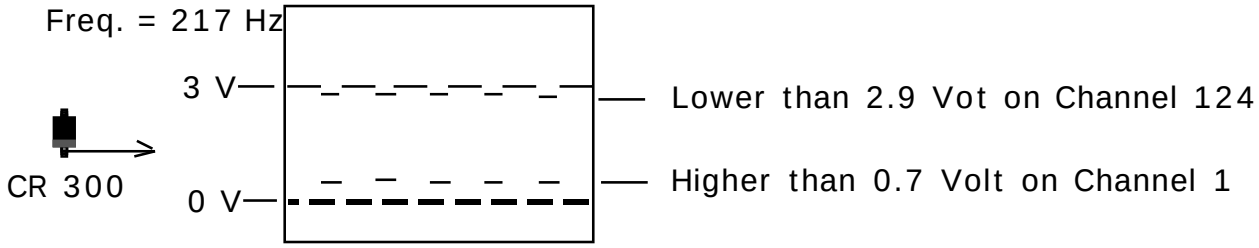
Test Procedure : (similation)

- Power up the radio with Battery Input of 7 Volt.
- Key in 11xxx # , 1215 #, 310 #
- Check the TX Power on HP 8922H- Active Cell - Ch:xxx - TX:15
- The TX Power should be within Spec. for all channels.
- The current reading on the power supply about 140 mA

Spec.: Tune Power Band x : 23 - 31 dBm
DAC Power Band x : 100 - 138

Trouble Shooting :

If the above Test Procedure looks OK, it propably the TX VCO problem , Check as shown :



If the pulse voltage is off (too low or too high). It will fail for these items.

Check US/WP/CD C306 and CD CR 300.

Oct 1 , 1996 Written By : Tony Cheung

AFC MID CHANNEL F1 / F5 Khz :

The Test Bay do the following :

1. Select the channel 62
2. Set Tx power to level 10
3. Set AFC DAC to 0 (F1)
4. Initiate pulse carrier with Pseudo.
5. Calculate F1 = frequency Offset / 43104.46 * 2
6. Stop the transmiter.
7. Repeat the above test with AFC DAC to 4095 (F5).
8. Calculate F5 = frequency Offset /43104.46 * 2

Spec : F1 : - 22.5 to - 155 Khz
F5 : 27 to 150 Khz

Test Procedure :

Power the radio with Battery Input of 7 V.

1. Key in 11062# , 260000# , 1210# , 40 #
2. Set HP8922H - Test Mode - CW Meas.
3. Read the frequency as Fa

F1 = (Fa + 67 Khz) / 43104.46 x 2

Example :

F1 = (902,263,888 Hz + 67,000 Hz) / 43104.46 x 2
= 41867 Hz
= 41 Khz

(It is negative , because compare with Fc [902.4 Mhz] , it is lower than 902.4 Mhz)

for F5:

4. Key in 37# (Clear) . 11062# , 1210# , 264095 # , 40# .
5. Read the frequency as Fb

F5 = (Fb + 67 Khz) / 43104.46 x 2

Example :

F5 = (902,383,336 Hz + 67,000 Hz) / 43104.46 x 2
= 42 Khz.

(It is positive , because compare with Fc[902.4 Mhz] , it is higher then 902.4 Mhz)

Trouble Shooting : Trouble shooting refer to " Pull Range " & " TX Freq Low"

AFC COEFF C30, C20, C10 & C00 :

Test Bay useing equations to calculate the coefficients of C00 to C30 , and store these four calculated curve coefficients and DAC Offset value in EEPROM.

Test Procedure : There is no similar test for the hand set command. Do the AFC Phasing by the Uniphase , If the radio pass the AFC test , it proprably is NT.

Trouble Shooting :

1. Do the Pull Range test.
2. Set the channel to 62, TX level 15.
   - Set the AFC DAC 0, 585, 1170, 1755, 2340, 2925, 3510 & 4095 (By using 26xxxx#).
   - Check the frequency & the TX power respone to the AFC DAC setting.

* Note : The AFC DAC is 585 per step , and the frequency step up is about 16 Khz. If what you check is close to this reading, the radio is NT. If the reading is not proportional. Check US/WP C247, C203, C201 and C202

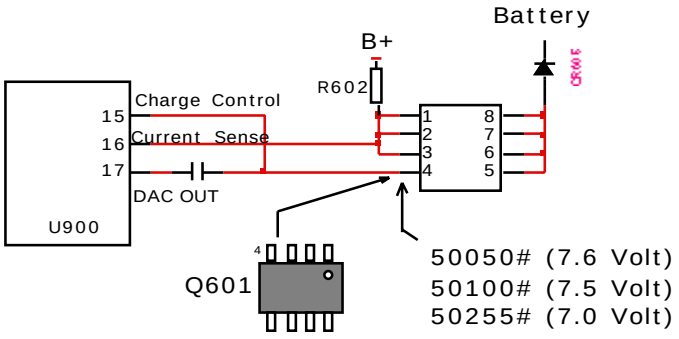
BATTERY LOW/ HIGH/ MAX CURR MODE :

This test to phase the Battery Charger and store the DAC value into the EEPROM.
The test bay will do the folowing:
1. Set the external supply to 8.6 Volt to power up the radio.
2. Connect the Battery Input with power supply #3 of 7.2 Volt (Be sure the radio is ON).
3. Set the charger to Low Current Mode .
4. Read the current as I1.
   I1 is within specification 100 - 170 mA
5. Set the charger to High Current Mode.
6. Read the current as I2.
   I2 is within specification 200 - 400 mA .
7. Set the charger to Max Current Mode.
8. Read the current as Imax.
   Imax is within specification 900 - 2000 mA.

Test Procedure :
1. Connect 8.6 Volt to the erxternal connector with power supply #1.
2. Connect 7.2 Volt to the battery input with power suplly #3 .
   (Be sure the radio stay ON)
3. Set the radio in Test Mode.
4. Key in 500030# (Low current charge mode)
5. Read the current as I1.
6. Key in 500070# (High current charge mode)
7. Read the current as I2.
8. Key in 500255# (Max current mode)
9. Read the current as Imax.

Trouble Shooting :

1. Check as shown :



2. If the current is off a little, re-tune the radio.
3. If the current stay in 0 or maximum.
   - Check R602, US U900-16 .
   - Take Q601 off, then key in 50050# , U900-15 should be 0 V, then key in 50000# , U900 - 15 should be about 6 - 8 V (with ripple) , If not CD U900.

CHARGER BYTE :

Oct 1 , 1996 Written By : Tony Cheung

The test bay using the equations to calculate Byte 1 & Byte 2 , then store these Bytes in to EEPROM.

Slope = 50 / (I2 - I1)
Byte 1 = 256 * Slope
Byte 2 = 2 x (100 - (Slope x I2))

Spec : Byte 1 : 0 - 255
Byte 2 : 5 - 255

Test Procedure :(Record I1 and I2 from the previous test)

Example: (I1 = 150 mA)
(I2 = 380 mA)

Slope = 50 / (380 - 150)
= 0.217

Byte 1 = 256 x 0.217
= 55

Byte 2 = 2 x (100 - (0.217 x 380)
= 35

Trouble Shooting :

If the radio passed the “Batt Low/High Current Mode”, it should not be ailed for this test, because the equations using the result of the previous test. If it do fail, that means the radio can not store the Bytes in to the EEPROM. Check for US/SS on U705 and U701.

BATT B+ DAC L/H VOLT :

The test bay will do the following :

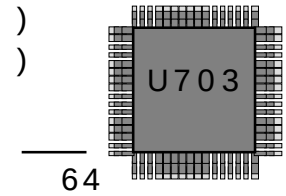
1. Set the external connector input to 9 V by power supply #1.
2. Connect the battery input with 7.5 V by power supply #3
3. Toggle the radio ON.
4. Read the Battery voltage .
5. Wait for 1 second for battery DAC to stabilized.
6. Request battery DAC value for 8 times.
7. Set battery input supply to 6.3 Volt.
8. Wait for 1 second for the battery DAC to stabilized.
9. Request battery DAC value for 8 times.

Spec .: B+ High Voltage : 6800 - 7600
B+ Low Voltage : 5600 - 6400

Test Procedure : There is no similar test by the hand set conmand.

Trouble Shooting :
1. 9V on External connector.
2. 7.5 V on battery input.
3.Toggle the radio Off then ON.
4. Measure the voltage on U703 -64 by DMM for 1.5 to 1.8 Volt.
Check for stable voltage by the Osc.Scope
5. Decrease the battery input from 7.5 Volt to 5 Volt.
6. Measure the voltage on U703 -64 by DMM for 0.5 to 0.7 Volt.
Check for stable voltage by the Osc. Scope.

1.5 - 1.8 Volt (8 V input)
0.5 - 0.7 Volt (5 V input)
Check for stable voltage
with Osc. Scope.



Check for US U900- 46,47
US U703 - 4,64
CD U900

SWITCH A+/ B+ GAIN/OFFSET

The test bay will:

1. Set the external connector input to 9 V by power supply #1.
2. Connect the battery input with 7.5 V by power supply #3
3. Toggle the radio ON.
4. Read the Battery voltage .
5. Wait for 1 second for battery DAC to stabilized.
6. Request battery DAC value as DAC1
7. Set battery input supply to 6.3 Volt.
8. Wait for 1 second for the battery DAC to stabilized.
9. Request battery DAC value as DAC 2

A+ Gain = 128 x [1000 x (7.5 - 6.3)] /DAC 2 - DAC 1

* where DAC 1 = 256 x Byte(3) + Byte(4) - for 7.5 Volt
DAC 2 = 256 x Byte(3) + Byte(4) - for 6.3 Volt

B+ Gain = 128 x [1000 x (7.5 - 6.3)] / DAC 2 - DAC 1

* where DAC 1 = 256 x Byte(5) + Byte(6) - for 7.5 Volt
DAC 2 = 256 x Byte(5) + Byte(6) - for 6.3 Volt

Spec .: A+ Gain 94 -160
B+ Gain 94 - 160

Test Procedure:There is no similar test on the analyzer's bench.

Trouble Shooting :

It should not be failed by this test , because it used the results from the previous test for calculation. Trouble shoot as " Batt+ DAC"

AGC SIMPLE CAMP

This test the radio camp the cell on channel 62 by the computer's command. It is not the radio itself to look for the broadcast channel and camp to it.

Oct 1 , 1996 Written By : Tony Cheung

The test bay will do :
1. Set the radio in test mode.
2. Set the HP 8922 to channel 62 , -60 dBm
3. Send a command to the radio to camp on channel 62 .

Spec. : 0 - 2 seconds.

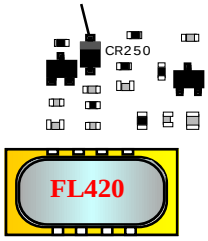
Test Procedure :

1. Set your HP8922 to Active Cell - CH62 - Amp: -60 dBm
2. Set the radio in Test Mode with the butt plug of 8 Volt.
3. Key in 33062 #
4. Check the camp status by Uniphase :
   EMMI - Camping - Request Camp Status.
   You should see : Radio Camped !

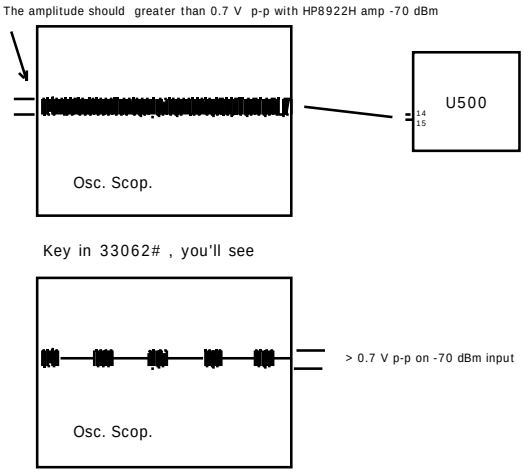
Trouble Shooting :

1. Set the Radio on Test Mode with Battery Input of 7.5 V.
2. Key in 33001# , check the voltage on CR250 , should be about 2 - 2.5 V.
   Key in 33124# , check the voltage on CR250 , should be about 2.8 - 3 V.

Check here for 2 to 3 Volt



3. Set the HP8922 - Active Cell - Ch62 - amp : -70dBm.
4. Key in 11062# , 08#
   you should see:


The amplitude should greater than 0.7 V p-p with HP8922H amp -70 dBm
U500
Osc. Scop.
Key in 33062# , you'll see
> 0.7 V p-p on -70 dBm input
Osc. Scop.

-Check AFC Table , If all set to 125, re-phase the radio , RA U705
If you see the above , the radio 90% NT, re-phase the radio. If it fail again CD U501 (Modem).

AGC COEFF C00/ C10

The test bay continue the previous test:

1. Start simple camp (HP 8922 - CH62 , -60 dBm)

Oct 1 , 1996 Written By : Tony Cheung

2. Verify unit has camped and request AFC DAC.
3. Request RXI and RXQ power.
4. Calculate Norminalized power by equations.
5. Calculate RF power.
6. Calculate DAC value.

- Repeat Step 3 - 6 for 3 times . Save the final calculation of the output & DAC value.

Test Procedure :

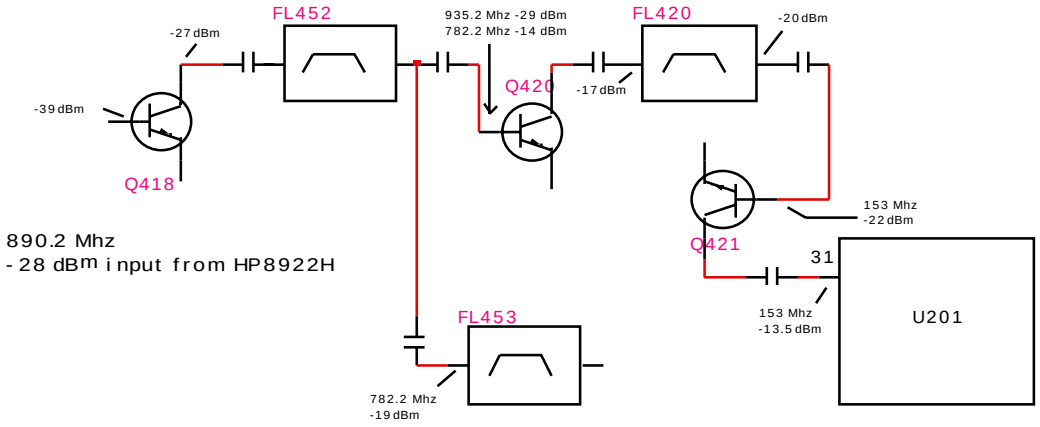
1. On Uniphase - Phasing - AGC -DHFA - 9 Band
2. You will see the unit display -118, 19 , 0
(This is not a correct reading , the computer initial the radio on the begining)
3. You'll then see these on the HP 8922 :

RF GEN Fre (Frequency Changing)	RF GEN Amplitude (Calculate RF power required for 1 V p-p RXI & RXQ)
Channel 1,14,30,46,62,78,94,110 &124	

Trouble Shooting :

If the radio fail the above test :

- Trouble shoot as " AGC Simple camp "
- Check for the path as shown :



AGC STEP ATTEN dB

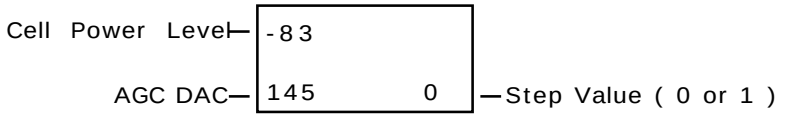
Test Procedure :

1. On HP8922 - Cell Status - CH62 - (-70 dBm)
2. Key in 33062# (to do the simple camp)
3.On Uniphase - EMMI - Camping - Request camp status.
Radio camp ! (If the radio is not camp, do it again , or preset the HP8922)
4.Switch Uniphse - Other - Monitor AFC/AGC DAC.

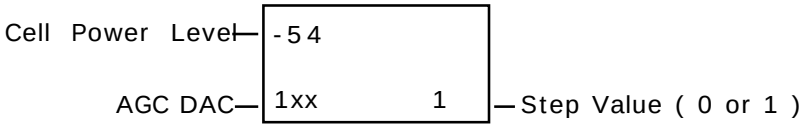
Radio Camped : 1 (radio is camp)
AFC DAC : 2417 (May various)
AGC DAC : 180 (May various)
Step in/out : 0 (Step of the Attenuator)
Calc RX Pwr : -72 dBm (The reading of the RX power on the radio) P1

5. On HP8922 step up the amplitude slowly,and watch the AGC DAC on Uniphase, The AGC DAC increase when you step up the amplitude, until the AGC DAC reach about 240 (may various). The step in/out change to 1 ,then the AGCDAC decrease into 1xx, step up the amplitude continue until the AGC DAC goes back to 180 .
Read the Cal RX power : as P2

(Or do the Simple Test as below :)
- HP8922 - Cell Status - CH62 , -80 dBm
- Key in 45062# , you should see this on the radio's display:



- Change the amplitude to -50 dBm
- Key in 45062# , you should see this on the radio's display



The Attenuator is working....
* Note : the radio should be camped to do this test.
Spec .: P1 - P2 should be 27 +- 5 dBm

Trouble Shooting :

- If you step up the amplitude to greater than -50 dBm ,but the "Step in/out" don't change from 0 to 1 :
- Check the RXI, RXQ for greater than 0.7 V p-p with -70 dBm input.
(If the RXI and RXQ is greater than 0.7 V p-p , CD U201)
(If the RXI and RXQ is less than 0.7 V p-p , trouble shoot as "AGC Simple Camp ")

STORE TABLES err

After all the calculations and Measurements . The Test Bay will store these data in EEPROM.

Oct 1 , 1996 Written By : Tony Cheung

-Wait for 1 second, then power off the radio, then on again .
-Read PA, AFC , Battery , RX I/Q abd AGC . Verify that the return value match the store value.

Trouble Shooting :
- If it fail this test , that means the data can not be stored in to the EEPROM or
the verifying is wrong .
- Re- phase the radio. or Check for US/SS EEPROM , CD EEPROM

INIT_TIME_CAMP_SEC

To verify that the radio will camp on a Broadcast Channel within a specific time limit.
The Test Bay set HP8922 to channel 124, -85 dBm

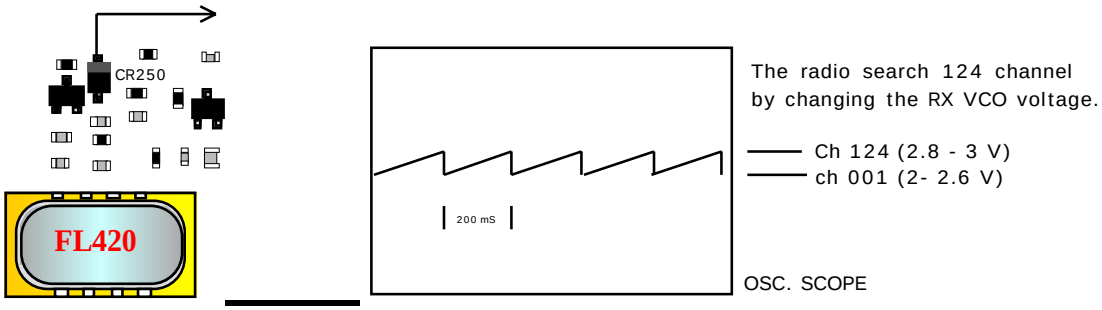
- Power up the radio with the butt plug of 7 Volt
- Wait for 10 seconds to check radio is camped to the cell by Uniphase - EMMI - Camp - Camp Status.

Test Procedure:

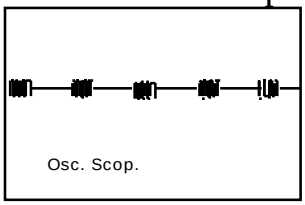
1. Set HP8922 to channel 124, -85 dBm
2. Power up the radio with the Battery Input of 6 Volt
3. Wait for the radio to camp to the cell
   It will display : 001 -- 01 ____

Trouble Shooting :

1. If the radio did not camped Preset the HP8922, turn the radio off and on to check it again.
2. Check the wave form as shown:



- If you don't see the above wave form:
  Check :US :U201,R295 WP : C256,C209,C262
  CD U201
- If the wave form looks OK, decrease the amplitude from -85 dBm to -102 dBm clowly. If the radio still campled . It is NT. If the radio loose camped on -102 dBm , Check the receive path.
- If you see the wave form :
  Check : U500 RXI/RXQ pin 14/15 with Osc. Scope for :



If the RXI/RXQ as the above : CD 500 (Modem)

CAMP CURRENT

To check the current of the radio after it camped to the cell.

Test Procedure :

Do the same setup/test as the previous test, read the current on the power supply .
The current drain of the radio should be within spec.

Spec .: 40 - 190 mA

Trouble Shooting :
Do the same test as above, wait about 8 seconds after camp (001-01 display) for the back lites "off" . Read the current on the power supply, typical current is 40 - 50 mA.

1. If the current is less than 40 mA (rare).
   Do the phone call test , to check whether it can generate a call.
   Use Uniphase to check AFC and AGC phasing.
2. If the current greater than 190 mA (after the back lites are "off"
   - Check whether it is generating a TX pulse,you can do it by:
     - Set the HP8922 on Cell Status : TX channel to 62, TX level 10
     - Camp the radio.
     - Set your spectrum analyzer frequency to 902.4 , span 50 Mhz. sweep 150 mS.
     - Monitor the antena port of the radio to check whether there is a TX pulse.
       If there is, CD U702 (software)
3. This fail item is caused by various things, check for unsolder and solder shorted.

CALL ORIGINATE HIGH CH

To verify that the radio will properly originate a phone call.

Test Procedure :

1. Set up the HP8922H for a phone call test (Manually or with Uniphase).
2. Use the following setup in the cell control screen:
   Channel : 1, 62, 124 (Test for each channel)
   RF Gen Ampl :
   TX power level :5
3. Connect the RF cable to a Gizmo and insert into the radio's antena port.
4. Power up the radio using the battery connector with 6 Volt.(with Sim Card).
5. Wait for the radio to camp on a Broadcast channel (Dispay : 001-01)
6. Dial 1 2 3 OK and view :
   Proceeding - Alerted - Connected . on Cell Status.

Trouble Shooting :

1. If the radio did not camp, trouble shoot as "Simple Camp "
2. If the radio can originates an emergancy call(1 1 2 OK), but not a normal call
   then there is a software problem- Probably the wrong value stored in the
   EEPROM. View EEPROM data on Uniphase , compare with a good radio > If
   the data dose not match up, try to retune board. If the data still wrong , then
   replace the EEPROM.
3. Check the transmitter and receiver for unusual loss of signal.
4. Run power step and RX LVL test.
5. Check PA Table:
   - If it is default setting , Reajust U705 (The bench did not write to the EEPROM)
   - If it is set to 255 - 255 , NT the radio, re-run it .

AUDIO UPLINK

To test the audio path from the transmitter.

The Test Bay will do the following :

1. Initiate a phone call from the unit.

2. Enable hand free audio path.
3. Send 1 Khz tone with amplitude 150 mV RMS.
4. Verify the level of the 1 Khz within specification.

Spec. : 950 - 1450 mV

Procedure 1 (Without opening the radio)

A. In H mode on the HP8922H select the Cell Control screen and place the phone in a call state.

B. Select Audio from Cell Control screen and set the following:

*Speech to COND
*Speech gain to 1.0
*"Speech Out " on AF ANL IN

C. Set AF Gen Levels on Audio screen

*Frequency = 1.0 Khz
*Amplitude = 150 mV

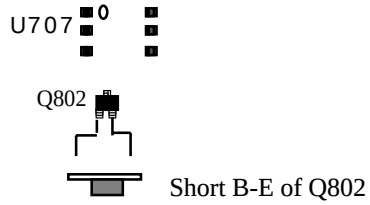
D. Verify that call remained connected

1. Go to your audio monitoring screen
2. Using Uniphase:
   a. Goto Key Strokes , Other
   b. Stop the program using Atl-F4
   c. Type: CALL EMMI("SetAudPath",0)
      (This command is case sensitive.)
   d. Hit "Enter"
   e. Hit Continue Alt-F2
   f. Check the mV level on the HP8922 Audio screen.

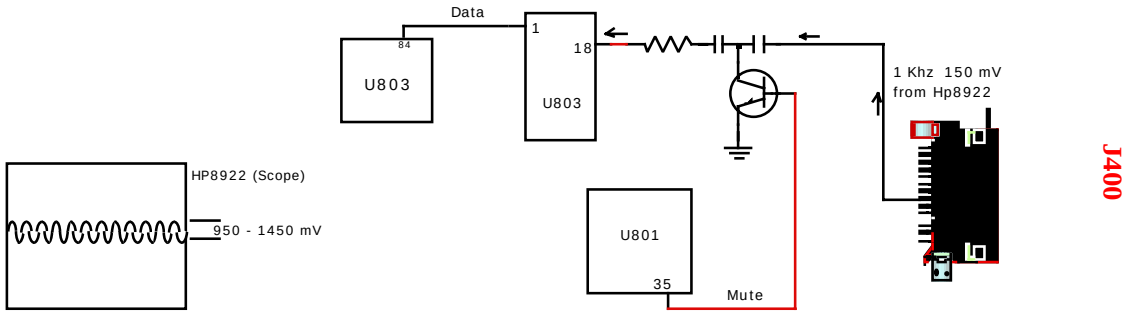
Procedure 2 :

- Set up the HP8922 : Cell Status - Audio (1Khz, 150 mV, Speech :none , AF Anl In = Speechout) - Cell Cntl - Scop (Vert/div=1V, Time/div= 500uS)
- Make sure that the 1 Khz tone is coming to the External connector p8.

1. Camp the radio & make a phone call .(123 OK)
2. Short B-E of Q802 to disable Q802 (to let the 1 Khz goes into U803-p8)

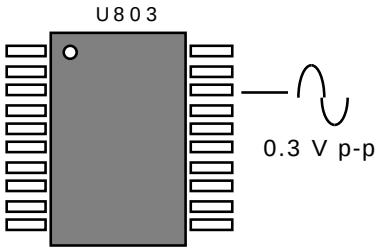


3. You should see the 1 Khz signal on HP8922 (Scope)with 950 - 1450 mV rms. (or Check the AC level x 1.4 rms)(This 1Khz tone is a modulation signal and is send out throught the antena)



Trouble Shooting :

- Set up HP8922 : Cell Ctnl - Audio (Freq:1 Khz, Amp: 0.5 V)
  1. Put the radio into Test Mode.
  2. Key in 430#
  3. Check the 1 Khz signal on J400 -p8 with Scope, it should be 0.7 V RMS
  4. Check the 1 Khz signal on 803 - p18 , it should be 0.3 V p-p.



If the signal less than 0.4 V p-p , trace the signal as shown :

1. Camp the radio and wait for 1 second.
2. Initiate a phone call .
3. Decrease the supply voltage to 6.4 V.
4. Send audio 1 Khz tone with amplitude 150 mV rms.
5. Verfify the level of the 1 Khz is within specification.

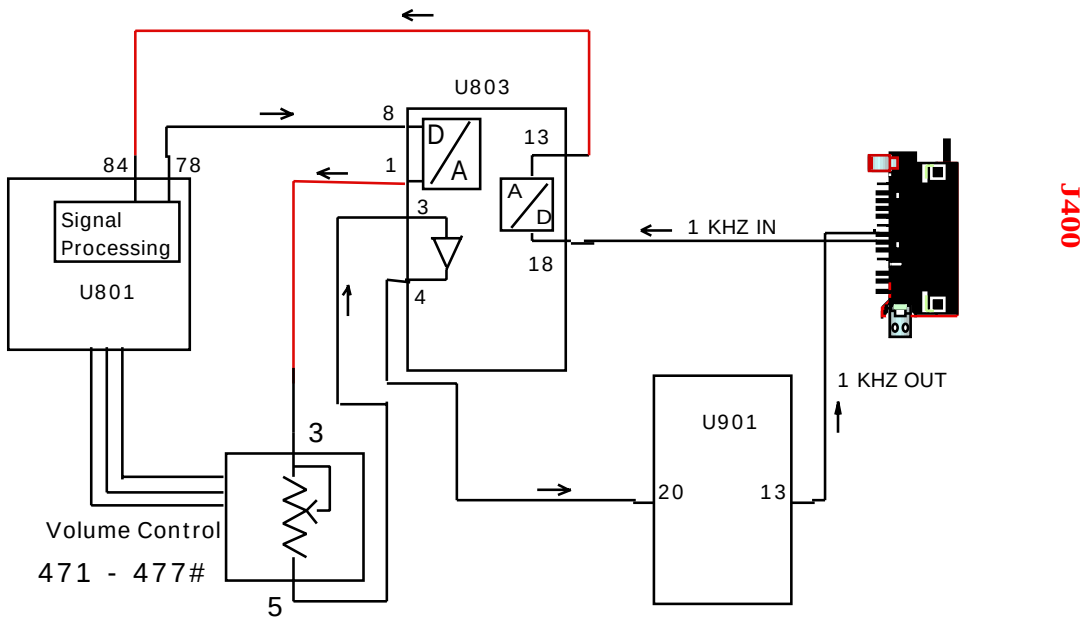
Spec.: 440 - 840 mV

Test Procedure :

Set the HP8922 - audio (1 Khz , 1 Volt)

Make sure the 1 Khz tone on the J400 - p8

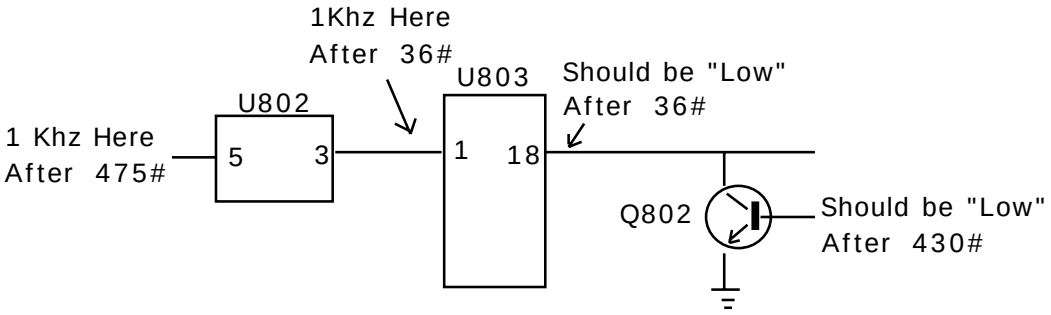
1. Power up the radio with the butt plug of 7.5 V.
2. Set the radio into Test Mode.
3. Key in 430# (Enable the audio tone to U803,18)
   475# (Audio Volume level 5)
   36# (Audio Loop)
4. Verify the 1 Khz on your scope channel 2, it should be about 0.5 V p-p.
   (This signal goes out from J400, p7)



Trouble Shooting :

If you can make a phone call ,(By setting BCH 1, -102 dBm. TX CH 124 , level 5) The audio downlink is to check the path of the circuitry that was shown above.

1. Set up as the test procedure.
2. Check the path as below:



3. - If no 1 Khz output on U803-1 after 36# , CD U803.
   - If no 1 Khz output on U802-5 after 475# , Check for US on U801 pins 46,47 , 48 and U802 p1,2 & 7 . or CD U802.

CHANGE RF DN HIGH (LOW) CH

Hi Channel : BCH:1 TX CH:124
Low Channel : BCH :124 TX CH:1

This is not a test, the test bay do the changing of the RF setting.
The test bay will :
Set Hp8922 Cell Cntl- BCH : 1 ampl : -103 dBm (DN) & -85 (UP)
TCH : 124 level : 5

There will be no failure on this test.

RX LEVEL HI (LOW) CH

Hi Channel : BCH:1 TX CH:124
Low Channel : BCH :124 TX CH:1

- To test the Receive Level on High Channel at 5.6 Volt (This test is the continuos of the previous test.) (This test compare with the analog is a SINAD test)

Test Procedure:

Set up HP8922 Cell Status:

BCH : 1 , ampl.: -102 dBm
TX CH : 124 , level 5

1. Power up the radio with the Battery Input of 6 Volt.
2. Wait until it camp.
3. Make a phone call by key in 123 OK.
4. After connected , check the RX level on HP8922 , should be "4" or higher.
5. Decrease the power supply voltage to 5.6 Volt.
6. The RX level should be stay unchange.

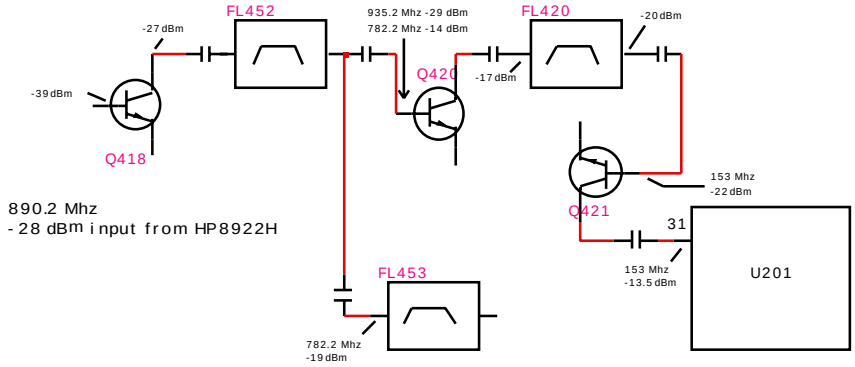
Spec.: 4 - 12

Trouble Shooting :

1. If the radio do not camp , trouble shoot as "Simple Camp "

Oct 1 , 1996 Written By : Tony Cheung

2. Set the HP8922H on Test Mode with amplitude -28 dBm on Channel 1
   Power up the radio with the Butt Plug of 7 Volt.
3. Key in 08#, 11001#
4. Check the RX Path as shown :



5. Check RXI/RXQ at U500 pins 14 and 15 as shown on Tuning
   "RX Level"
   -Need the following to have a good RXI & RXQ
   * 316 Mhz LO(Tank) - controlled by U201-43
   * I/Q Ref. Voltage from U500 - 16 about 1.35 volt.
   * 153 Mhz IF (from ISO Amp. Q421)
   * SPI_DATA /SPI_CLK from U501 (Modem)

RX QUALITY HI (MID)(LOW) CH

Hi Channel : BCH:1 TX CH:124
Mid Channel : BCH 1 TX CH :62
Low Channel : BCH :124 TX CH:1

To test the Receive Signal's quality on High Channel at 5.6 Volt
(This test compare with the analog is a RSSI test)

Test Procedure:

Set up HP8922 Cell Status:

BCH : 1 , ampl.: -102 dBm
TX CH : 124 , level 5

1. Power up the radio with the Battery Input of 6Volt.
2. Wait until it camp.
3. Make a phone call by key in 123 OK.
4. After connected , check the RX Qty on HP8922 , should be "0" or less than "3".
5. Decrease the power supply voltage to 5.6 Volt.
6. The RX level should be stay unchange.

Spec.: 0 - 3
0 = good quality, 3 is the limit .

Trouble Shooting : Refer to the previous trouble shooting.

BER CHECK HIGH (MID)(LOW) CH

(Bit Error Rate)

Hi Channel : BCH:1 TX CH:124
Mid Channel : BCH :1 TX CH :62
Low Channel : BCH :124 TX CH:1

To test the percentage of the Bit Error in the receiver on High Channel at 5.6 Volt

Test Procedure:
Set up HP8922 Cell Status:
BCH : 1 , ampl.: -102 dBm
TX CH : 124 , level 5
BER for 50 K Bits

1. Power up the radio with the Battery Input of 6 Volt.
2. Wait until it camp.
3. Make a phone call by key in 123 OK.
4. After connected , check the BER on HP8922 , should be less than 2 %.
(Check the BER reading after 50,000 bits is transfered.)
5. Decrease the power supply voltage to 5.6 Volt.

Oct 1 , 1996 Written By : Tony Cheung

6. re-run the Bit Error Rate again
7. The BER on HP8922 should be the same as less than 2%.

Spec.: < 2%

Trouble Shooting :

This test is the same for checking the "RX Level/Quality", if the radio failed this item ,increase the amplitude of the boardcast channel from -102 dBm to -100 or higher, if the BER goes back to less than 2% within 2 dBm increase , check your cable for loss.

Trouble as " RX Level/Quality"

CRC CHECK HIGH (MID) (LOW)CH

(Cycle Redundancy Check)

Hi Channel : BCH:1 TX CH:124
MID Channel : BCH :1 TX CH: 62
Low Channel : BCH :124 TX CH:1

To test the ratio of the Cycle Redundancy Check in the receiver on High Channel at 5.6 Volt

Test Procedure:

Set up HP8922 Cell Status:

BCH : 1 , ampl.: -102 dBm
TX CH : 124 , level 5
BER

1. Power up the radio with the Battery Input of 6 V.
2. Wait until it camp.
3. Make a phone call by key in 123 OK.
4. After connected , check the CRC ratio on HP8922 , should be less than 0.1 %.
   (Check the CRC reading after 50,000 of bits is transfered.)
5. Decrease the power supply voltage to 5.6 Volt.

6. Re-run the Bit Error Rate again
7. The CRC on HP8922 should be the same as less than 0.1 %.

Trouble Shooting :

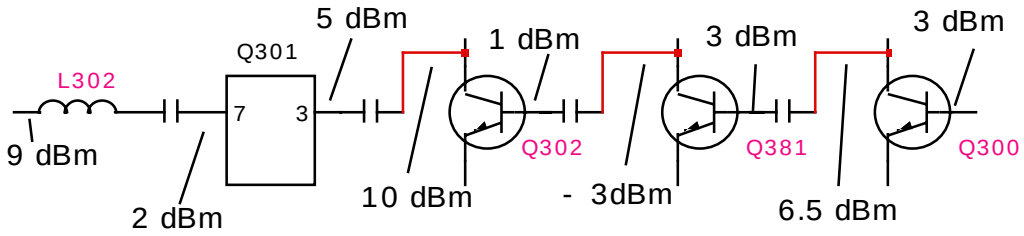
This test is the same for checking the "RX Level/Quality", if the radio failed this item ,increase the amplitude of the boardcast channel from -102 dBm to -100 or higher, if the CRC ratio goes back to less than 0.1 % within 2 dBm increase , check your cable for loss.

Trouble as " RX Level/Quality
CD Modem

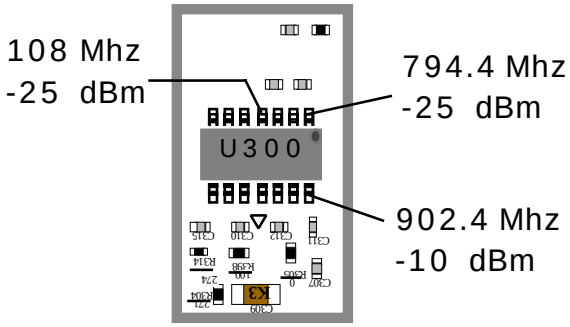
POWER STEP 5 HIGH CH

To test the radio at maximum TX power by low voltage supply.
(This is a pre-test for the following test.)

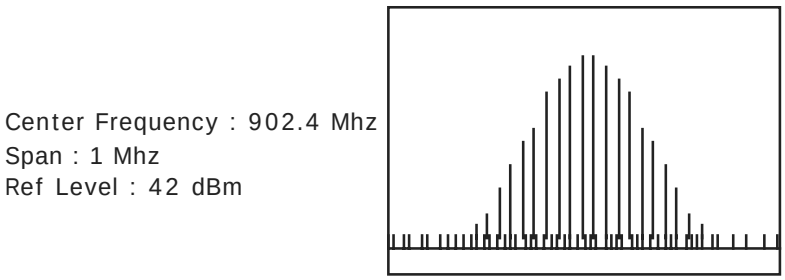
The Test Bay will do the following :
Set up the HP8922 Cell Status:
BCH:1 ampl : -102 dBm
TCH : 124 level : 5
1. Power up the radio with the Battery input of 6 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Step up the HP 8922 BCH -102 dBm to -85 dBm.
6. Measure the TX power should be within specification.
Spec.: 30.8 - 35 dBm
Trouble Shooting :
- If The TX Power is off Specification :
  - Key in 11062#, 1215# , 40# and check the path as shown:



- If no TX Power at all , Check U300 for 108 Mhz, 794.4 Mhz and 902.4 Mhz as Shown :

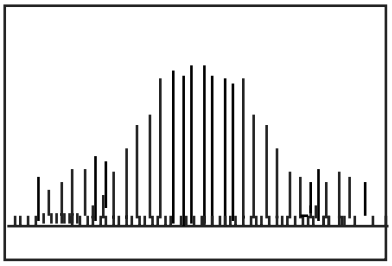


- If the above looks good, but fail for Power Step 5 (Max Power)
  1. Key in 11062# , 1205#, 310#
  2. You should see this on HP8922H -> Anl:



Check the TX Power on HP8922H -> Active Cell -> Ch 62
-> TX Power :01 . It should be within 27 +4 dBm
(The Cable loss about 2.5 dBm)

3. If you see this :

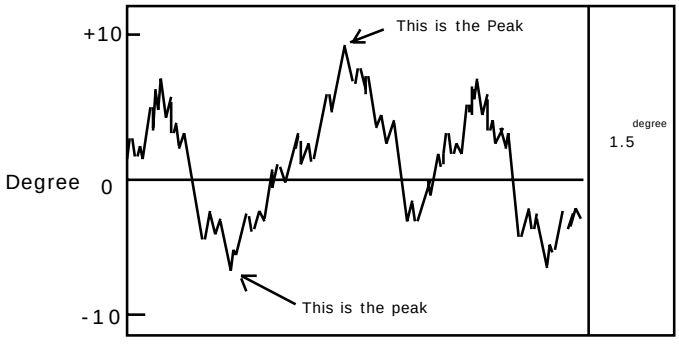


Check negative supply for ripple .

PEAK PHASE ERROR HIGH CH

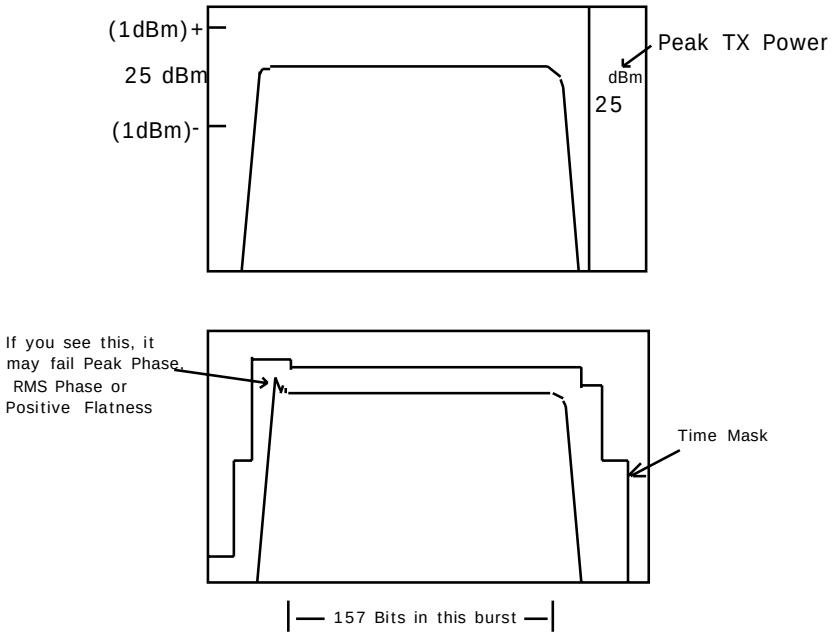
This test the error of the peak phase. During the transmiting, the Phase of the TX is not stable at all time, if the peak of the phase over the spec's limit, it will fail this item. To learn about this:

1. Make a phone call.
2. Set up HP8922 Cell Status - Phase Freq , to see the Peak Phase reading
   or:
3. Cell Status- Phase Freq - View Phase Err: You will see this on HP8922



When the radio transmiting the TX power should not be fluxuated over 2 dBm . For example : If the TX power is 25 dBm , so the fluxuating should not higher than 26 dBm or lower than 24 dBm. Use HP8922 Cell Status-Pwr Ramp to see the signal:

Oct 1 , 1996 Written By : Tony Cheung



Test Procedure :

The Test Bay will do the following :

Set up the HP8922 Cell Status:

BCH:1 ampl : -102 dBm

TCH : 124 level : 5

1. Power up the radio with the Battery Input of 6.2 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Step up the HP 8922 BCH -102 dBm to -85 dBm.
6. Measure the TX power should be within specification.

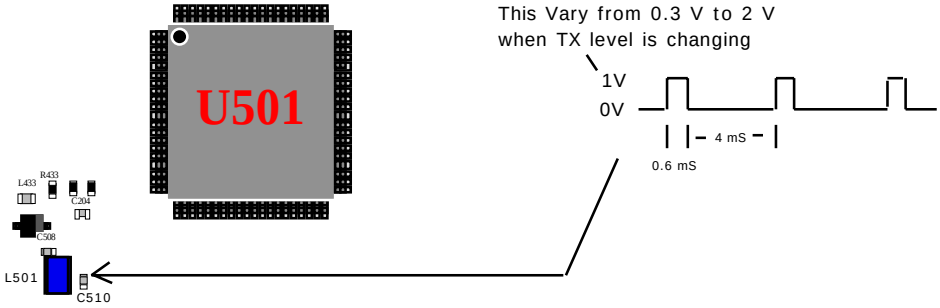
Spec.: < 20 degree

Trouble Shooting :

1. Step down the TX level on HP8922 to check whether the peak phase error is back to within the specification,
   - If yes (only 2 or 3 step down) , the radio may be not phased correctly. Re-phase the radio.

- If No :

2. Check the AOC line from U500 p32,33 to U301 -9 for unstable voltage.



3. Check the PA table compare with a good radio's setting.
4. Make sure the connection of the cable are good.

RMS PHASE ERROR HIGH (LOW) CH

(Root Mean Square)

What we see the amplitude of the wave form on Osc. Scope is not the actual AC measurment by the DMM . We have to devide this wave form's amplitude by 1.4, we called this Wave form's p-p value "RMS"

The measurement of this test is the Root Mean Square of the averge fluxuation of the burst.

The Test Bay will do the following :

Set up the HP8922 Cell Status:

BCH:1 ampl : -102 dBm

TCH : 124 level : 5 (high channel)

- Phase error

1. Power up the radio with the Battery Input of 6 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Step up the HP 8922 BCH from -102 dBm to -85 dBm.
6. Verify the measurement of the RMS Phase Error shold be within spec.

Spec.: < 5 degree

Compare figures A & B , A has the higher paek the B , but the average fluxuation is less than B in a burst. So B may fail RMS Phase Error test.

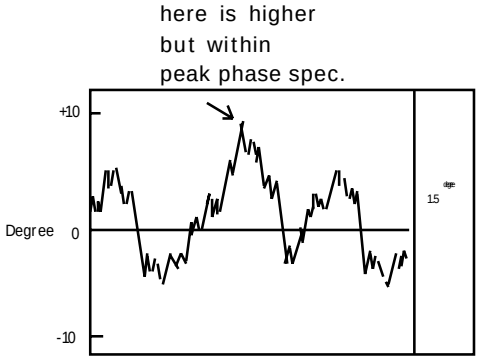


Figure A

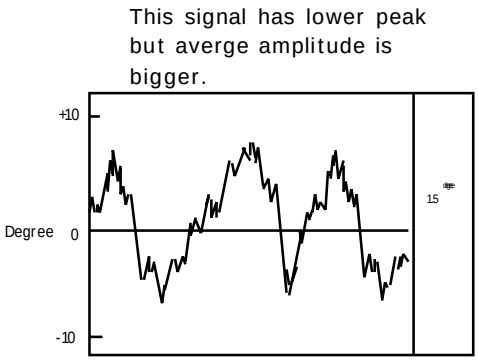


Figure B

Trouble Shooting :PA : Over gain.

TX FREQUENCY ERROR HIGH (MID) (LOW)

This test the radio's frequency by 5.6 V at CH124 (62 & 1) at Maximum power.

The Test Bay will do the following :
Set up the HP8922 Cell Status:
BCH:1 ampl : -102 dBm
TCH : 124 level : 5
HP8922 : Cell Cntl - Phase Freq (Frequency Error)

1. Power up the radio with the Battery Input of 6 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Verify the Frequency error on HP8922 is within specification.

Spec.: + - 91 Hz

Trouble Shooting :

Check the stability of the Y201 Crystal oscillator circuit - see if it's drifting off frequency.

See TX Freq Pull Range Procedure.

1. CD U201
2. If the frequency error is 200 Hz or above , CD U500 (Modem)

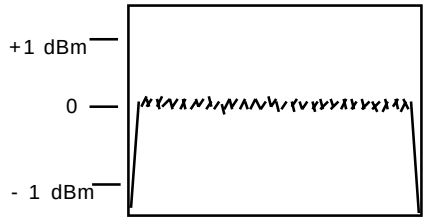
NEGATIVE FLATNESS HIGH (MID) (LOW) CH
POSITIVE FLATNESS HIGH (MID) (LOW) CH

When the radio transmitting , the TX power should not be fluxuated over + - 1 dBm , if it does ,it will fail this test.

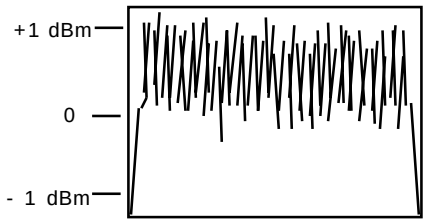
During a phone call , you can see the following wave form On HP8922
Cell Status - Pwr Ramp(Top 2 dBm):

Oct 1 , 1996 Written By : Tony Cheung

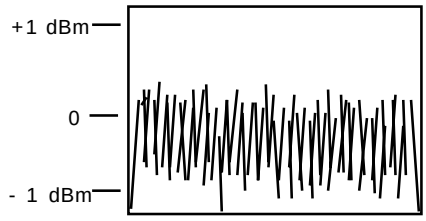
HP8922
Cell Status -> Pwr Ram (Top 2 dBm)



Typical wave form of a TX burst at maximum power



Failed for Positive Flatness
(The amplitude fluxuate higher than + 1 dBm)



Failed for Negative Flatness
(The amplitude fluxuate lower than - 1 dBm)

The Test Bay will do the following :
Set up the HP8922 Cell Status:
BCH:1 ampl : -102 dBm
TCH : 124 level : 5 (High CH)

1. Power up the radio with the Battery Input of 6 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Step up the HP 8922 BCH from -102 dBm to -85 dBm.
6. Verify the Negative Flatness should be within specification.
HP8922 : Cell Status -> Phase Error

Spec.: Negative Flatness > -1 dBm
Positive Flatness < +1 dBm

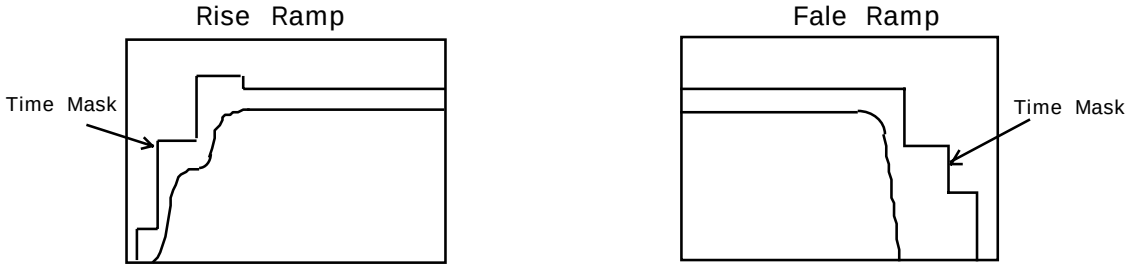
Trouble Shooting : Same as "Peak Phase"

TIME MASK HIGH

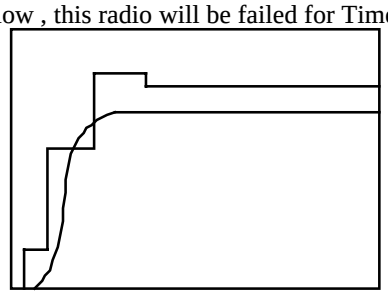
When the radio transmitting , the TX burst and the AOC line from the Modem should be in the same time , when the pulse from the AOL line of the Modem earlier or later than the TX Burst , the radio will be failed for this test.

During a phone call , you can see the following wave form On HP8922
Cell Status - Pwr Ramp(Ramp Rise/Ramp False)

Oct 1 , 1996 Written By : Tony Cheung



If the burst cross the time mask as shown below , this radio will be failed for Time Mask test.



The Test Bay will do the following :
Set up the HP8922 Cell Status:
BCH:1 ampl : -102 dBm
TCH : 124 level : 5 (High CH)

1. Power up the radio with the Battery Input of 6 V.
2. Verify the radio is camped.
3. Initiate a call.
4. Decrease the power supply to 5.6 V.
5. Step up the HP 8922 BCH from -102 dBm to -85 dBm.
6. Verify the The burst should be within the time mask on HP8922 : Cell Status -> Pwr-Ramp(Rise Ramp/False Ramp)

Spec : 1

Trouble Shooting :

- Check AOC line on U310-8 . If the resistor R357 & L501 is Unsolder.
If the value of R357 is higher " from 85K to 150 K" will fix the problem.

TX CURRENT HIGH CHANNEL

The Test Base will do the following :

Power up the radio from the Battery Input of 6Volt.

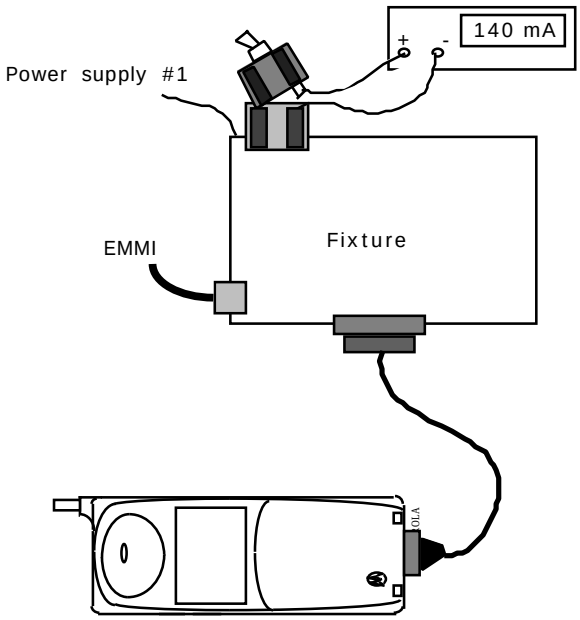
1. Set up HP8922 : BCH : 1 , RF level : -90 dBm
TCH :124 , TX Level :5
2. Camp the radio.

Oct 1 , 1996 Written By : Tony Cheung

3. Initiate a phone call.
4. Verify the ouput power on HP8922 should be within 30.8 - 35 dBm.
5. Increase the RF level to -85 dBm
6. Verify the average current is within specification.

Spec : 100 - 300 mA

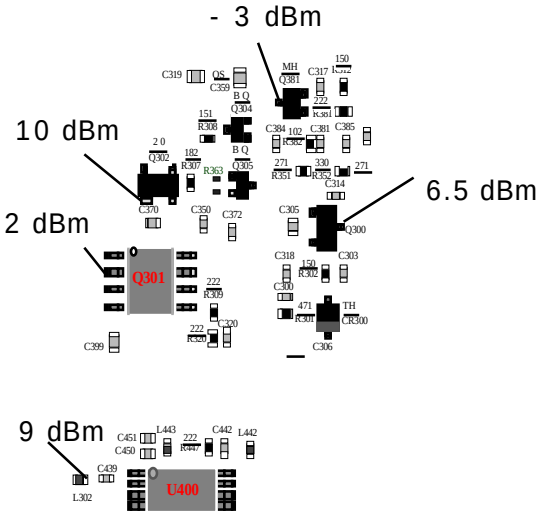
Test Procedure: Due to the HP6623 A Power Supply not respone the pulsing current, so we have to read the current from the DMM. Do the set up as below:

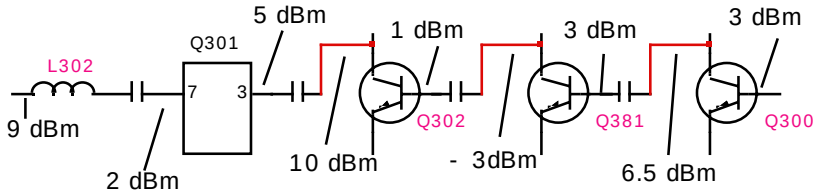


1. Power up the radio with the
   Butt Plug of 7 Volt.
2. Key in 11001#, 1215#, 310#
3. Read the TX Power on the HP8922H. It should be within 10.3 to 18 dBm (typical : 13 dBm).
4. Read the current on the DMM , it should be within 100 to 400 mA. (typical : 140 mA)

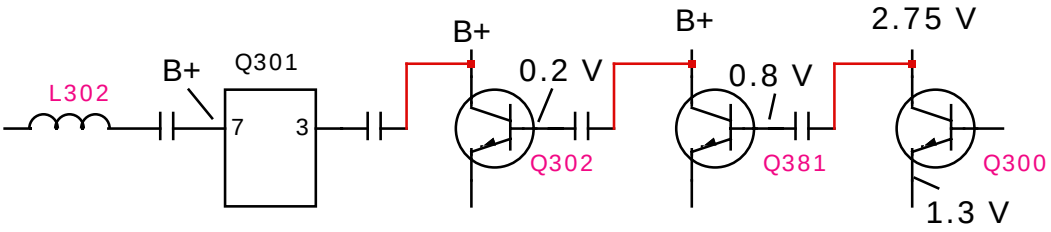
Trouble Shooting :

1. If the TX Power is low on power level 15 , check the path for power loss as below :





2. If the current is off specification, Check the voltage as below:



TX current is almost always caused by a power control problem. usually because the gain of the PA is turned up to high causing excessive current drain. Look at the power control biasing on the gates of the PA Q301 . If the control voltage is to high then the radio may transmit at the proper level , but could be drawing too much current . Compare this control voltage to a good board , if it is too high then there is a slight loss in TX path somewhere, or a problem with the power detect/control circuitry around U310.

BASE END CALL

After the previous tests , the Test Bay will end the call from HP8922 by using the “END CALL” function.

Spec.: 1

Trouble Shooting :
Usually this item will not fail the radio. If it does, it may be the software problem.

CONFIRM TIME CAMP

To verify that the radio camp to the Cell within 10 seconds.

Test Procedure :
1. Set up HP8922 , BCH : 124 , -102 dBm

TCH : 1 , TX level : 5

2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped Using EMMI command “RQCS”.

Spec.: 0 - 10 seconds

Trouble Shooting :

Trouble Shooting refer to “ Simple Camp “

BASE CALL LOW CHANNEL

To verify that the radio will connect a phone call from Base to Mobile.

Test Procedure :

1. Set up HP8922 , BCH : 124 , -90 dBm

TCH : 1 , TX level : 5

2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped.
4. Originate a call from the HP8922.
5. Set HP89 advance to 40T
6. Reduce RF level of the BCH to -102 dBm.
7. Verify the radio stay in the phone call.

* Note : You may have to place a call from the Mobile(Radio) to Base first in order to give the Base the IMSI#. View setup “Request”-“Alerting” then open flip or press “OK” to answer call. Call Status should be “CONNECTED”.

Trouble Shooting :Run RX test, check forloss somewhere in the receive path , check transimitter path also.

1. If the RX path looks OK , Check as RX Level:
   - Set HP8922 on Test Mode (-28 dBm , CH 1)
   - Power up the radio with the butt plug of 7.5 V.
   - Key in 11001 #
   - Check RX path as RX Level.

If the signal looks good:

2. Set HP8922 to -70 dBm
   - Check RXI/Q level should be over 0.7 V p-p
   - If RXI/Q is 0.7 V p-p or over , CD U500
   - If RXI/Q is lower than 0.7 V p-p , CD U201

SET TIME ADVANCE

To test the time advance function of the radio. In the field, when serveral user are communicate with the base station by the same channel in the same time , they use differnet time slot, but some are close to the cell while the others are far from the cell. So the cell have to send out the command to set the timing to different user to avoid interference.

1. Set up HP8922 , BCH : 124 , -90 dBm
   TCH : 1 , TX level : 5
2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped.
4. Initiate a phone call.
5. Set HP8922 timing advance to 40 T.
6. Reduce the RF level of HP8922 to -102 dBm
7. Wait for 2 seconds.
8. Verify the RX Quality and RX Level are good on HP8922.

Spec. : 4

Trouble Shooting :
Usually this item will not fail the radio. If it does, it may be the software problem.

RESET TIME ADVANCE

After the Cell set the time advance to check the radio on the phone call. It reset the time advance to 0.

1. Set up HP8922 , BCH : 124 , -90 dBm
   TCH : 1 , TX level : 5

2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped.
4. Initiate a phone call.
5. Set HP8922 timing advance to 40 T.
6. Reduce the RF level of HP8922 to -102 dBm
7. Wait for 2 seconds.
8. Verify the RX Quality and RX Level are good on HP8922.
9. Verify the TX : Frequency Error, Peak and RMS Phase Error , Time Mask and current is within specification.
20. Set the HP8922 Timing Advance to 0T.

Spec. 4

Trouble Shooting :
Usually this item will not fail the radio. If it does, it may be the software problem.

HAND OVER

To test the radio stay "ON" from :

1. Band 1 (Channel 1) to Band 2 (Channel 62)
2. RX level -90 dBm to -85 dBm.
3. TX level 5 to level 15

The test bay will do the following:

1. Set up HP8922 , BCH : 124 , -90 dBm
TCH : 1 , TX level : 5
2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped.
4. Originate a call from the HP8922.
5. Change the TX level from 5 to 15
6. Increase RF level of the BCH to -85 dBm.
7. Change the TCH from 1 to 62
7. Verify the radio stay in the phone call.

Spec. : 4

Trouble Shooting :Usually there is no failure on this test , because the major thing to test the radio is to switch the channel 1 1 to channel 62 and this is done by item " Change RF UP/DN". IF it does fail, it may be caused by the bad software.

END CALL ERROR

To test the radio for ending a call . We end the call by either close the flip or press "OK".

The Test Bay will do the following :

1. Set up HP8922 , BCH : 124 , -85
   TCH : 62 , TX level : 15
2. Power up the radio with the Batterty Input of 6 Volt.
3. Verify the radio is camped.
4. Originate a call from the HP8922.
5. After connected,the test bay send out a command “END” to end the call. (This is similate to to key in “END” in the key board)

Spec.: 1

Trouble Shooting : Usually there is no failure on this test , because the major thing to test the radio is from the DownLink(J400-4) from the EMMI to tell the radio to terminate the call. IF it does fail, it may be caused by the bad software.

BATTERY DAC VALUE

This test the radio’s DAC. The radio read the battery voltage in analog mode ,then convert it into digital mode by U703, send this message out through J400 -5 (Uplink) to EMMI.

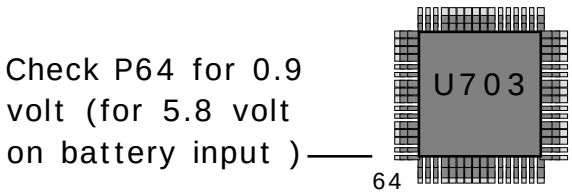
The test bay will do the following :
1. Connect the Battery Input with 5.8 V by power supply #3

2. Toggle the radio ON.
3. Read the Battery voltage by Uniphase.

Spec .: 5600 - 6500

Test Procedure : Do the same test as the test bay does.
1. Connect the Battery Input with 5.8 Volt.
2. Toggle the radio “ON”.
3.Go to Uniphase - Monitor Battery
4. Read the Batt+ reading (Don’t care about the A+, because there is no Butt Plug power input)

Trouble Shooting :
Connect the radio with the Butt Plug of 7.2 V, Battery Input of 5.8 V. Power up the radio.
- Measure the voltage on U703 -64 by DMM for 0.9 Volt.
  * If you got this 0.9 V on U703 - 64 , you still don’t have a reading by Uniphase, CD U703
  * If you don’t get this reading on U703- 64,check U900 - 47,46 and 48 for unsolder or CD U900.
- Check for stable voltage by the Osc.Scope



Misc.

PA Table

If the radio never been tuned , the PA Table will be :

FS/SCS255	
SMT/PRT	255
“	255
“	255

They all set for 255

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“ “
MULT 100-124 255

After Tuned

FS/SCS> 0		PA DAC	10	104	
SMT/PRT	106		PA DAC	11	140
DET HIGH	10		PA DAC	12	128
DET LOW	20		PA DAC	13	85
PA DAC 0	66		PA DAC	14	53
PA DAC 1	40		PA DAC	15	52
PA DAC 2	27	MUL 0-24		128	
PA DAC 3	187		25-49		128
PA DAC 4	187		75-99		128
PA DAC 5	187		100-124	128	
PA DAC 6	187				
PA DAC 7	140				
PA DAC 8	145				
PA DAC 9	120				

After Phased

FS/SCS> 0		PA DAC	10	83	
SMT/PRT	106		PA DAC	11	69
DET HIGH	10		PA DAC	12	57
DET LOW	20		PA DAC	13	57
PA DAC 0	66		PA DAC	14	41
PA DAC 1	66		PA DAC	15	35
PA DAC 2	66	MUL 0-24			
PA DAC 3	66		25-49		
PA DAC 4	66		75-99		
PA DAC 5	66		100-124		
PA DAC 6	57				
PA DAC 7	48				
PA DAC 8	38				
PA DAC 9	30				

Tone

Continue tone : 16#, 477# , 432# , 1530#

Misc. for trouble shooting :

* Radio don’t camp even it pass tune. : It has to be phased or do the AFC and AGC Phasing by the Uniphase, then it camp.

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* After tune, the PA table is not set right yet.

* After tune , you can do the AFC and AGC by “Uniphase” then you can make a call.

---------- END ----------

K06 PROGRAMS/SHOP ORDERS **Modem GCAP Models**

GSM8700

RADIO	BOARD	S/ ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	T/S stencil	Bottomside prog	B/S Stencil	version	Status
SWF3052A	SLF6830C	E45	29	36	432	K06 ITALY	C01	0109033A43	LC9452	0109032A94	LC9679	74.05.36	obsolete
SWF2266B	SLF6830C	E46	29	36	433	K06 NON ITALY	C06	0109033A43	LC9452	0109032A94	LC9679	74.05.36	obsolete
SWF3169A	SLF7360A	E50	29	11	567	BMW	C06	0109037A85	LC9452	0109031A97	LC9679	74.06.11	obsolete
SWF3232A	SLF7360B	E51	29	12	670	JAGUAR	C06	0109038A34	LC9452	0109031A97	LC9679	74.06.12	obsolete
SWF3169B	**SLF7360C**	**E56**	**29**	**14**	**368**	**BMW**	**C06**	**0109039A48**	**LC9452**	**0109031A97**	**LC9679**	**74.06.14**	**current**
SWF3232B	**SLF7360C**	**E57**	**29**	**14**	**479**	**JAGUAR**	**C06**	**0109039A48**	**LC9452**	**0109031A97**	**LC9679**	**74.06.14**	**current**

GSM6700

RADIO	BOARD	S/ ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	T/S stencil	Bottomside prog	B/S Stencil	version	Status
SWF3049A	SLF6920E	J43	32	36	430	K06 ITALY	C01	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete
SWF2376D	SLF6920E	J44	32	36	445	K06 NON ITALY	C06	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete

SM6700 E/FLIP

RADIO	BOARD	S/ ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	T/S stencil	Bottomside prog	B/S Stencil	version	Status
SWF3051A	SLF6920E	Y13	29	36	444	K06 ITALY	C01	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete
SWF2526B	SLF6920E	Y14	29	36	443	K06 NON ITALY	C06	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete

GSM6200i

RADIO	BOARD	S/ ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	T/S stencil	Bottomside prog	B/S Stencil	version	Status
SWF3050A	SLF6920E	J45	32	36	446	K06 ITALY	C01	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete
SWF2539C	SLF6920E	J46	32	36	447	K06 NON ITALY	C06	0109033A45	LC9452	0109033A44	LC9679	78.63.36	obsolete

K06 MODEM G-CAP LITE PROGRAMS/SHOP ORDERS

GSM8700

RADIO	BOARD	SHOP ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	Bottomside prog	version	status
SWF3052B	SLF6830D	E49	30	36	460	K06 ITALY	C01	0109037A11	0109037A10	74.05.36	obsolete
SWF2266C	SLF6830D	E48	30	36	393	K06 NON ITALY	C06	0109037A11	0109037A10	74.05.36	obsolete
SWF3052C	SLF6830E	E52	30	12	677	K06 ITALY	C01	0109038A57	0109037A10	74.06.12	obsolete
SWF2266D	SLF6830E	E53	30	12	678	K06 NON ITALY	C06	0109038A57	0109037A10	74.06.12	obsolete
SWF3052C	**SLF6830E**	**E54**	**30**	**14**	**345**	**K06 ITALY**	**C01**	**0109038A57**	**0109037A10**	**74.06.14**	**current**
SWF2266D	**SLF6830E**	**E55**	**30**	**14**	**362**	**K06 NON ITALY**	**C06**	**0109038A57**	**0109037A10**	**74.06.14**	**current**

GSM6700

RADIO	BOARD	SHOP ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	Bottomside prog	version	status
SWF3049B	SLF6920F	J45	33	36	464	K06 ITALY	C01	0109037A13	0109037A12	78.63.36	obsolete
SWF2376E	SLF6920F	J46	33	36	463	K06 NON ITALY	C06	0109037A13	0109037A12	78.63.36	obsolete
SWF3049C	SLF6920G	J47	33	1	679	K06 ITALY	C01	0109038A58	0109037A12	78.64.01	obsolete
SWF2376F	SLF6920G	J48	33	1	680	K06 NON ITALY	C06	0109038A58	0109037A12	78.64.01	obsolete
SWF3049C	**SLF6920G**	**J49**	**33**	**2**	**480**	**K06 ITALY**	**C01**	**0109038A58**	**0109037A12**	**78.64.02**	**current**
SWF2376F	**SLF6920G**	**J50**	**33**	**2**	**452**	**K06 NON ITALY**	**C06**	**0109038A58**	**0109037A12**	**78.64.02**	**current**

SM6700 E/FLIP

RADIO	BOARD	SHOP ORDER	HW	SW	PRE FIX	DESCRITION	Antenna	Topside prog	Bottomside prog	version	status
SWF3051B	SLF6920F	Y15	30	36	461	K06 ITALY	C01	0109037A13	0109037A12	78.63.36	obsolete
SWF2526C	SLF6920F	Y16	30	36	462	K06 NON ITALY	C06	0109037A13	0109037A12	78.63.36	obsolete
SWF3051C	SLF6920G	Y17	30	1	681	K06 ITALY	C01	0109038A58	0109037A12	78.64.01	obsolete
SWF2526D	SLF6920G	Y18	30	1	682	K06 NON ITALY	C06	0109038A58	0109037A12	78.64.01	obsolete
SWF3051C	**SLF6920G**	**Y19**	**30**	**2**	**468**	**K06 ITALY**	**C01**	**0109038A58**	**0109037A12**	**78.64.02**	**current**
SWF2526D	**SLF6920G**	**Y20**	**30**	**2**	**476**	**K06 NON ITALY**	**C06**	**0109038A58**	**0109037A12**	**78.64.02**	**current**

GSM8700 Smoc SMT Programs

Radio	Board	shop order	HW	SW	s-ware version	pre fix	PCB	Topside prog	Bottomside prog	Description	E/I Shipped	Status
SWF2640A	SLF7010A	S8	1	9	95:01:09	454	8409486L09_P9.1	0109035A05	0109035A04	post ship .09 s-ware	No	obsolete
SWF2640B	SLF7010B	S9	1	9	95:01:09	455	8409292U02.T2	0109036A39	0109036A38	post ship .09 s-ware	No	obsolete
SWF2640A	SLF7010A	S10	1	10	95:01:10	673	8409486L09_P9.1	0109035A05	0109035A04	post ship new .10 s-ware	Yes	obsolete
SWF2640B	SLF7010B	S11	1	10	95:01:10	630	8409292U02.T2	0109036A39	0109036A38	post ship new .10 s-ware	Yes	obsolete
SWF2640A	**SLF7010A**	**S12**	**1**	**10**	**95:01:10**	**453**	**8409486L09_P9.1**	**0109035A05**	**0109035A04**	**Smoc with D54 G.cap**	**No**	Rework only
SWF2640B	SLF7010B	S13	1	10	95:01:10	631	8409292U02.T2	0109036A39	0109036A38	not used	No	obsolete
SWF2640C	**SLF7010C**	**S14**	**1**	**10**	**95:01:10**	**750**	**8409292U02.T2**	**0109039A26**	**0109039A25**	**Smoc with D54 G.cap**	**Yes**	**current**
SWF3539A	**SLF7620A**	**T1**	**1**	**10**	**95:01:10**	**932**	**8409292U02.T2**	**0109039A26**	**0109039A49**	**Smoc with Toshiba Saw**	**Yes**	**current**
SWF3539B	**SLF7620B**	**T2**	**2**	**10**	**95:01:10**	**TBA**	**8409292U02.T3**	**0109040A10**	**0109040A09**	**Smoc with D84 G.cap new pcb**	**Yes**	**current**

(N.B)All SWF2640A units have entertainment mute disabled.

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Preface

Specifications

Table 1: General

Function	Specification
Frequency Range	890-915 MHz TX 935-960 MHz RX
Channel Spacing	200 kHz
Channels	124 carriers with 8 channels per carrier
Modulation	GMSK at BT = 0.3
Transmitter Phase Accuracy	5 Degrees RMS, 20 Degrees peak
Duplex Spacing	45 MHz
Frequency Stability	$\pm$ 0.10 ppm of the downlink frequency (Rx)
Operating Voltage	+5.7 to +8.5V dc
Transmit Current	<200 mA average, 1.0 A peak
Stand-by Current	Average 10mA (DRX 2)
Dimensions	131 mm (L) x 59 mm(W) x 24 mm(D) (5.2” x 2.3” x 0.9”)
Size (Volume)	165 cubic cm (10 cubic in) (w/LP4 battery)
Weight	Approximately 154g; Includes Super Slim LiIon battery pack and antenna
Temperature Range	-20°C to +55°C

Table 2: Transmitter

Function	Specification
RF Power Output	33 dBm $\pm$ 2dBm
Output Impedance	50 ohms (nominal)

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Table 2: Transmitter

Function	Specification
Spurious Emissions	-36 dBm up to 1 GHz, (<-30 dBm > 1 GHz)

Table 3: Receiver

Function	Specification
RF Level	-102 dBm
RX bit error rate (100 k bits)	< 2%
Channel Hop Time	500 microseconds
Time to Camp	Approximately 10 seconds

Table 4: Speech Coding

Function	Specification
Speech Coding Type	Regular Pulse Excitation / Linear Predictive Coding with Long Term Prediction. (RPE LPC with LTP.
Bit Rate	13.0 k bps
Frame Duration	20 ms
Block Length	260 bits
Classes	Class 1 bits = 182 bits. Class 2 bits = 78 bits
Bit Rate with FEC Encoding	22.8 k bps

Specifications subject to change without notice.

Foreword

Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It is intended primarily to support electrical and mechanical repairs. Repairs not covered in the scope of this manual should be forwarded to Motorola's regional Cellular Subscriber Support Centers.

Authorized distributors may opt to receive additional training to become authorized to perform limited component repairs. Contact your regional Customer Support Manager for details.

Model and Kit Identification

Motorola products are specifically identified by an overall model number on the FCC label. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them.

Service

Motorola's regional Cellular Subscriber Support Centers offer some of the finest repair capabilities available to Motorola Subscriber equipment users. The Cellular Subscriber Support Centers are able to perform computerized adjustments and repair most defective transceivers and boards. Contact your regional Customer Support Manager for more information about Motorola's repair capabilities and policy for in-warranty and out-of-warranty repairs in your region.

Replacement Parts Ordering

Motorola maintains a parts office staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Cellular products. Orders for all parts should be sent to the Motorola International Logistics Department at the following address:

Attn: Global Spare Parts Department
Motorola Cellular Subscriber Group
2001 N, Division St.
Harvard, IL 60033-3674
U. S. A.
FAX: 1-815-884-8354

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

General Safety Information

Portable Operation

DO NOT hold the radio so that the antenna is very close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if it is held in the same manner as you would hold a telephone handset, with the antenna angled up and over your shoulder. Speak directly into the mouthpiece.

DO NOT operate the telephone in an airplane.

DO NOT allow children to play with any radio equipment containing a transmitter.

Mobile Operation (Vehicle Adaptor)

As with other mobile radio transmitting equipment, users are advised that for satisfactory operation of the equipment and for the safety of personnel, it is recommended that no part of the human body shall be allowed to come within 20 centimeters of the antenna during operation of the equipment.

DO NOT jump start vehicle or use an automotive battery charger while the vehicle adapter option and the portable radiotelephone are connected to the vehicle electrical system as this may cause serious damage to the radio. Disconnect the radio by removing the cable kit fuses.

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are under certain conditions capable of interfering with blasting operations. When in the vicinity of construction work, look for and observe signs cautioning against mobile radio transmission. If transmission is prohibited, the cellular telephone **must be turned off** to prevent any transmission. *In standby mode, the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.*

All equipment must be properly grounded according to installation instructions for safe operation.

Portable/Mobile Telephone Use and Driving

Safety is every driver's business. The portable telephone should only be used in situations in which the driver considers it safe to do so. Use of a cellular portable while driving may be *illegal* in some areas.

Refer to the appropriate section of the product service manual for additional pertinent safety information.

MOTOROLA

Cellular Subscriber Group

CONTENTS

GSM 8700/6700

Preface iii

Specifications iii
Table 1: General iii
Table 2: Transmitter iii
Table 3: Receiver iv
Table 4: Speech Coding iv

Foreword v

Replacement Parts Ordering v

General Safety Information vi

Description 1

Product Description 1
Figure 1: GSM 8700 Personal Cellular Telephone 3

Feature List 4

Theory of Operation 5

GSM System Overview 5

General Cellular Concept 5

GSM Description 5
Figure 2: Hypothetical Cell System 6
Figure 3: TDMA Transmission 7

Identity and Security 9

Transceiver Labelling 9
Figure 4: MSN Configuration 9
Figure 5: IMEI Configuration 9

SIM CARDS 10
Figure 6: Inserting SIM Card 10

Testing 13

Verification 13
Figure 7: Testing Configuration 14

Manual Test Mode 14
Table 5: GSM Test Commands 15

Personality Transfer 17

Introduction 17

Normal Transfer 17

Master Transfer 18

Master SIM Card Creation 19

Disassembly 21

Introduction 21

Recommended Tools 21

Disassembly Procedure 21

Assembly Procedure 21

Troubleshooting 27

Introduction 27

Troubleshooting And Repair 27

Testing After Repair 27
Table 6: Receiver Troubleshooting and Repair Chart 28
Table 7: Transmitter Troubleshooting and Repair Chart . . . . . * 29
Table 8: Logic/Processing Troubleshooting and Repair Chart 30

Troubleshooting Supplements 36
Figure 8: RF Block Diagram 47
Figure 9: Audio-Logic Functional Block Diagram 48

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Replacement Parts 49

GSM 8700 Electrical 49
Table 9: Replacement Parts List 49

GSM 8700 Mechanical 50
Table 10: GSM 8700 Replacement Parts List 50
Figure 10: GSM 8700 Mechanical Explosion Illustration 52

GSM 6700 Electrical 53
Table 11: GSM 6700 Replacement Parts List 53

GSM 6700 Mechanical 54
Table 12: GSM 6700 Replacement Parts List 54
Figure 11: GSM 6700 Mechanical Explosion Illustration 56

Glossary 57

Service Manual Feedback Form 63

Appendix A: ATE 65

Description

Product Description

General

The GSM 8700/6700 personal cellular telephone is a microprocessor controlled, full duplex, synthesized FM radiotelephone using digital modulation techniques, for use in compatible 900 MHz cellular radiotelephone systems. When operated properly, the equipment will provide the user with land-linked telephone service through individual cell site base stations, all linked to a central control office. The GSM 8700/6700 has a 3.0 Watt maximum power capability.

Physical Packaging

The transceiver circuitry is contained in a water resistant polycarbonate plastic housing measuring (including Slim battery pack) 130 mm (L) x 59 mm (W) x 23 mm (D) (5.2″ x 2.3″ x 0.9″). It weighs approximately 154g; includes Super Slim LiIon battery pack and antenna.

The main internal electronic circuitry is contained on two multi-layer boards. The keypad board assembly incorporates the display, keypad contacts and mylar switches, alert transducer, vibrator and earpiece speaker. The display is glued to the board by a foam gasket with electrical connections via a short flex strip. Also on the keypad board are the 6 pin contacts for the SIM card, the mute and volume button contacts and magnetic reed switch.

The RF/Logic board consists of the Audio/Logic circuitry on both sides of the lower half of the board and the RF circuitry on the top half. Electrical connections between the two sides of the board are provided by feed-through connectors at various points on the board. Also on the main board are the accessory connector, the battery contacts and the microphone plug socket. The microphone sits in a small pocket in the keypad membrane itself and connects to the main board via two wires terminated in a plug.

The accessory connector, situated at the base of the phone on the main board, allows connections to the audio/logic circuitry and antenna for accessory applications such as a mobile adaptor and chargers. When the accessory RF connector is used the RF to the top antenna is disconnected. Grounding shields, (with removable covers) on the main board provide electrical isolation and protection to the RF circuits. Interconnection between the two main boards takes place via a 41 pin female connector situated on the display board, and a corresponding male connector on the main board.

Operating power for the personal telephone can be obtained from anyone of the following sources:

- *-Slim Battery Lithium (SNN4383)*

  This rechargeable Lithium Ion battery pack is the lightest Motorola battery offered for the GSM 8700/6700. It measures 9.4mm thick, and gives approximately 33 hours standby.

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- *Slim Battery NiCad (SNN4132)*
  This rechargeable Nickel Cadmium battery pack measures 9.4mm thick, and gives approximately 33 hours standby.

- *Slim Extra Cap NiCad (SNN4102)*
  This rechargeable Nickel Cadmium battery pack measures 9.4mm thick, and gives approximately 45 hours standby.

- *Slim Battery NiMH (SNN4612)*
  This rechargeable Nickel Metal Hydride battery pack measures 9.4mm thick, and gives approximately 50 hours standby.

- *Standard Battery NiCad (SNN4027)*
  This rechargeable Nickel Cadmium battery pack measures 11.6mm thick, and gives approximately 58 hours standby.

- *Slim Extra Cap Li Ion (SNN4458)*
  This rechargeable Lithium Ion battery pack measures 18.5mm thick, and gives approximately 100 hours standby.

- *Extra Capacity Battery NiMH (SNN4259)*
  This rechargeable Nickel Metal Hydride battery pack measures 18.5mm thick, and gives approximately 108 hours standby.

- *Cigarette Lighter Adaptor (SLN9933)*
  The battery charger plugs into the accessory connector socket, situated at the base of the telephone, and a vehicle's cigar lighter socket.

  As well as providing a battery charging function, the charger provides power directly to the phone whilst it is in use even with a 'dead' battery.

- *Vehicle Adaptor Kits*
  There are various vehicle adaptor kits available. They all provide power to the unit from the vehicle's own electrical system, via the accessory connector socket (located at the base of the phone). All the kits offer battery charging as standard.

- *Travel Battery Charger*
  This is a mains adaptor which plugs directly into the phone. It charges the phone's battery whilst attached and also provides dead battery operation.

NOTE

The GSM 8700/6700 may have various battery options as standard depending on the particular market requirements.

Figure 1: GSM 8700 Personal Cellular Telephone

Feature List

An 'X' indicates that the feature is present in the GSM 8700/6700.

Feature List	Present
Visual/Audio Features	
Display	2 x 12 + Icons LCD Dot Matrix
Number Capacity (per location)	20
Name Capacity (per location)	16
Language Selection	14
Automatic Language Selection based on SIM	X
Silence Ringer w/Visual	X
Silence Keypad Tones	X
Adjustable earpiece volume	X
Adjustable ringer volume	X
Silence Scratchpad	X
Call in Absence Indicator	X
Display Signal Strength - continuous	X
Display Battery Level - continuous	X
Audible Low Battery Warning	X
Status Review	X
Microphone Mute	X
Illuminated Display	X
Backlight Display	X
Dedicated Control Keys	7
User Definable Wake Up Test	X
Call Placement Features	
VibraCall Alert	X
Selectable Ringer Tones	X
Selectable Keypad Tones	X
Short, Extended and Personalized Menu List	X
Auto Redial	X
Clear Last Digit/All	X
Mute Control	X
International Access Key Sequence	X
User Call Rejection	X
Pre-origination Dialling	X
Memories:	
Numbered	100
SIM Card - Dependent on SIM	X
Last 10 Numbers Dialed	X
Last 10 Numbers Received (if using CLI)	X
Notepad (Last Number Entered)	X
Turbo Dialling (9 Numbers 1 Touch Dial)	X
Quick Access	X
Alpha Name Storage	
(Recall by Name or Location	X
Memory Linking/Pause	X
Memory Auto Load	X
Memory Scroll	X
Alpha Name Scrolling	X
Memory Capacity	X
DTMF Signalling:	
Long Tone DTMF	X
DTMF from Memory	X
Postscripting	X
Menu Operation	X
Silent Alert	X
Call Diverting/Barring (Via the Menu)	X
Calling Line Identification (Present and Restrict)	X
Call Waiting	X
Call Hold	X
Master Clear	X
Master Reset	X
DTX (Discontinuous Transmission)	X
112 Emergency Call Origination	X

Feature List		Present
Cost Control Features		
Electronic Lock		X
Automatic Lock		X
Programmable Unlock Code		X
Display Unlock Code		X
Display Call Timers and/or Charge Meters:		
Last Call		X
Total		X
Home		X
Roam		X
Programmable Audible Call Timer:		
One Time		X
Repeatable (User Defined)		X
Automatic Timer Display:		
Charge (units/currency)		X
Minutes		X
Store Charge Rate:		
Home Rate		X
Roam Rate		X
Call Restriction Levels:		
Restrict Keypad Dialing		X
Variable Memory Recall Restriction		X
Restrict Incoming Calls		X
Restrict Phone Number Length (Vari)		X
Full Service-No Restrictions		X
PIN Entry		X
PIN Enable/Disable		X
PIN Change		X
PIN Unblocking		X
Network Related		
Service Selection:		
Auto PLMN Selection		X
PLMN Select from Scan List		X
Scan List Display (auto and manual)		X
Change Preferred List		X
Rearrange Order of Preferred List		X
Full Size SIM card		X
Display Own Phone Number		X
Advise of Charge		
Messaging And Data		
SMS:		
Mobile Terminated Point to Point		X
Cell Broadcast		X
Data Calls		X
9600 Data/Fax support		X
Alternating Speech/Fax		X
Vehicular Features		
On Hook Call Processing		X
Volume Adj-Speaker		X
Safety Timer		X
Full Duplex Hands Free	Operation	X
Ignition Sense	(Auto Turn On)	X
Entertainment Mute		X
Auto Answer		X
Other Features		
Status Indicators		X
Easy Battery Removal		X
Internal Charger		X
Dead Battery Operation with Chargers		X
Rapid Charger		X
Cigarette Lighter Charger (Option)		X

Theory of Operation

GSM System Overview

NOTE

The following description is intended only as a preliminary general introduction to the Global System for Mobile communications (GSM) cellular network. This description is greatly simplified and does not illustrate the full operating capabilities, techniques, or technology incorporated in the system.

General Cellular Concept

The cellular systems are used to provide radiotelephone service in the frequency range 890-960 MHz. A cellular system provides higher call handling capacity and system availability than would be possible with conventional radiotelephone systems (those which require total system area coverage on every operating channel) by dividing the system coverage area into several adjoining sub-areas or cells.

Each cell contains a base station (cell site) which provides transmitting and receiving facilities, for an allocated set of duplex frequency pairs (channels). Since each cell is a relatively small area, both the cell site and the radiotelephone that it supports can operate at lower power levels than would be used in conventional systems.

Using this technique, radiation on a given channel is virtually contained in the cell operating on that channel and, to some extent, those cells directly adjacent to that cell.

Since the coverage area of a cell on a given channel is limited to a small area (relative to the total system coverage area), a channel may be reused in another cell outside the coverage area of the first. By this means, several subscribers may operate within the same geographic area, without interference with each other, on a single channel.

GSM Description

Unlike previous cellular systems, GSM uses digital radio techniques. The GSM system has the following advantages over previous analogue systems:-

- *International Roaming* - Due to international harmonization and standardization, it will be possible to make and receive calls in any country which supports a GSM system.
- *Digital Air Interface* - The GSM phone will provide an entirely digital link between the telephone and the base station, which is, in turn, digitally linked into the switching subsystems and on into the PSTN.
- *ISDN Compatibility* - ISDN is a digital communications standard that many countries are committed to implementing.

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It is designed to carry digital voice and data over existing copper telephone cables. The GSM phone will be able to offer similar features to the ISDN telephone.

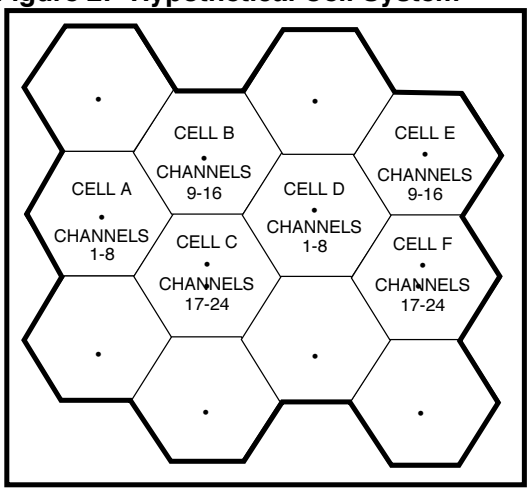
- *Security and Confidentiality* - Telephone calls on analogue systems can very easily be overheard by the use of a suitable radio receiver. GSM offers vastly improved confidentiality because of the way in which data is digitally encrypted and transmitted.

- *Better Call Quality* - Co-channel interference, handover breaks, and fading will be dealt with more effectively in the digital system. The call quality is also enhanced by error correction, which reconstructs lost information.

- *Efficiency* - The GSM system will be able to use spectral resources in a much more efficient way than previous analogue systems.

In the figure below, the area bounded by bold lines represents the total coverage area of a hypothetical system. This area is divided into several cells, each containing a cell site (base station) operating on a given set of channels which interfaces radiotelephone subscribers to the telephone switching system.

Figure 2: Hypothetical Cell System



The radiotelephones themselves are capable of operation on any channel in the system, allowing them to operate in any cell. Due to the low power requirements for communications between radiotelephones in a particular cell and the cell site, operating channels may be repeated in cells which are outside the coverage area of each other.

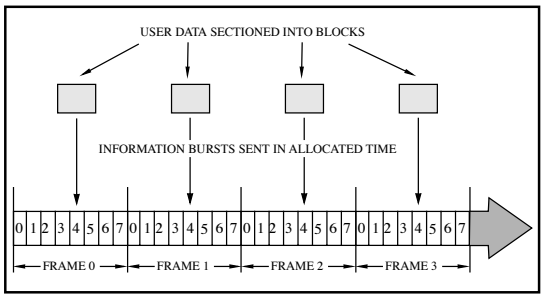
For example, presume that cell A operates on channels arbitrarily numbered 1 through 8, cell B operates on channels 9 through 16, cell C operates on channels 17 through 24 and cell D operates on channels 1 through 8 (repeating the usage of those channels used by cell A). In this system, subscribers in cell A and subscribers in cell D could simultaneously operate on channels 1 through 8.

The implementation of frequency re-use increases the call handling capability of the system, without increasing the number of available channels. When re-using identical frequencies in a small area, co-channel interference can be a problem. The GSM system can tolerate higher levels of co-channel interference than analogue systems, by incorporating digital modulation, forward error correction and equalization. This means that cells using identical frequencies can be physically closer, than similar cells in analogue systems. Therefore the advantage of frequency re-use can be further enhanced in a GSM system, allowing greater traffic handling in high use areas.

By incorporating Time Division Multiple Access (TDMA) several calls can share the same carrier. The carrier is divided into a continuous stream of TDMA frames, each frame is split into eight time slots. When a connection is required the system allocates the subscriber a dedicated time slot within each TDMA frame. User data (speech/data) for transmission is digitized and sectioned into blocks. The user data blocks are sent as information bursts in the allocated time slot of each TDMA frame, see Figure 3: "TDMA Transmission" on page 7.

The data blocks are modulated onto the carrier using Gaussian Minimum Shift Keying (GMSK), a very efficient method of phase modulation.

Figure 3: TDMA Transmission


USER DATA SECTIONED INTO BLOCKS
INFORMATION BURSTS SENT IN ALLOCATED TIME
0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
FRAME 0
FRAME 1
FRAME 2
FRAME 3

Each time an information burst is transmitted, it may be transmitted on a different frequency. This process is known as frequency hopping. Frequency hopping reduces the effects of fading, and enhances the security and confidentiality of the link. A GSM radiotelephone is only required to transmit for one burst in each frame, and not continually, thus enabling the unit to be more power efficient.

Each radiotelephone must be able to move from one cell to another, with minimal inconvenience to the user. The mobile itself carries out signal strength measurements on adjacent cells, and the quality of the traffic channel is measured by both the mobile and the base station. The handover criteria can thus be much more accurately determined, and the handover made before the channel quality deteriorates to the point that the subscriber notices.

When a radiotelephone is well within a cell, the signal strength measured will be high. As the radiotelephone moves towards the edge of the cell, the signal strength and quality measurement decreases.

Signal information provides an indication of the subscriber's distance from the base station. As the radiotelephone moves from cell to cell, its control is handed from one base station to another in the new cell.

This change is handled by the radiotelephone and base stations, and is completely transparent to the user.

Service Area

The area within which calls can be placed and received is defined by the system operators. (Because this is a radio system, there is no exact boundary that can be drawn on a map.) If the telephone is outside a coverage area, the ∅ (no service) indicator will illuminate and calls will be unable to be placed or received. If this happens during a conversation, the call will be lost. There may also be small areas within a particular service area where communications may be lost.

The radiotelephone's identity information is held by its local GSM system in its Home Location Register (HLR) and Visitor Location Register (VLR). The VLR contains identity information on all local active radiotelephones. Should you roam to another area, system or country the radiotelephones identity information is sent to the VLR in the new system. The new system will then check the radiotelephones details with your home system for authenticity. If everything is in order it will be possible to initiate and receive calls whilst in the new area.

Identity and Security

Transceiver Labelling

Introduction

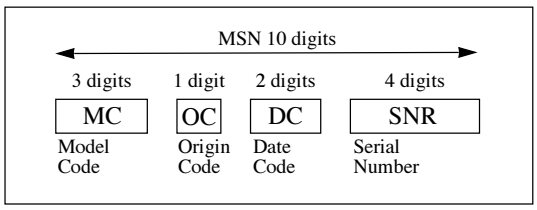
Each Motorola GSM transceiver will be labelled with various number configurations. The following information shows and explains the common labelling titles.

Title Explanations

MSN

The Mechanical Serial Number (MSN) is an individual number, uniquely identifying the unit. The MSN will remain the same throughout the units life, even if the main board is replaced. Because the MSN is unique to the unit, it is often used for logging and tracking purposes by Motorola National Service Centres on EPPRS. The MSN is divided into the sections shown below.

Figure 4: MSN Configuration

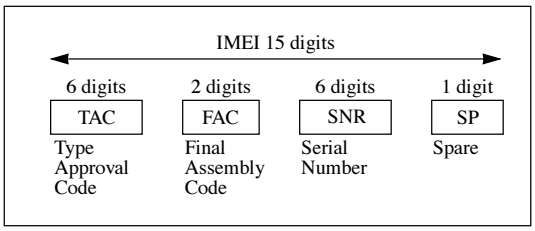


CEPT GSM

This is the International Mobile Station Equipment Identity (IMEI) number. The IMEI is held in the logic circuitry.

If the main board is replaced then the units IMEI will change, therefore the units labelling should be updated with the new IMEI. An IMEI uniquely identifies a mobile station equipment to the system, and is divided into the sections shown below.

Figure 5: IMEI Configuration



REV S/H

This configuration consists of two blocks of two digits, and denotes the software and hardware versions within the unit. The first two digits correspond to the software version, and the last two digits correspond to the hardware version. If a version update is carried out on the unit, the corresponding change information should be made apparent on the labelling.

Model

The model number defines the type of product. Each product type is issued a common model number.

Package

The package number is used to determine the type of equipment, the mode in which it was sold, and the language with which it was shipped.

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SIM CARDS

Introduction

The Motorola GSM 8700/6700 personal cellular telephones are designed to work with the full size Subscriber Identity Module (SIM). The SIM card contains all the personal data required to access GSM services. Data held by the SIM card includes:

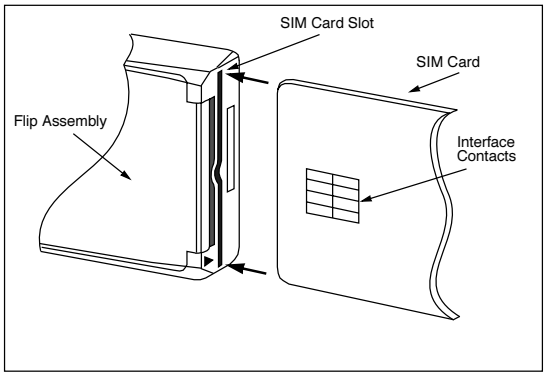
- International Mobile Subscriber Identity
- Temporary Mobile Subscriber Identity
- Home system
- Services subscribed to
- PIN and unblocking codes
- Call barring codes

The SIM card may also be capable of storing phone numbers and names.

SIM Card Insertion/Removal

The SIM card must be inserted into the unit correctly so that the card can be read, and the data checked for validity, before operation on the system will be enabled. The card contains all of the user's personal identification numbers and details of the system the phone operates on.

Figure 6: Inserting SIM Card



The whole SIM card should slide completely and securely into the slot at the base of the phone.

Ensure that the contacts of the card face towards the front of the phone (i.e. towards the flip).

The sliding, card release button will move upwards as the SIM card is inserted. When the button reaches the top of its recess and the card is flush with the base of the phone, it is inserted correctly. To remove the SIM card from the unit, push the sliding SIM card release button downwards. The card will then be pushed out far enough to allow complete removal.The User Guide contains full information about inserting and removing the SIM card.

Security Information

To stop unauthorized personnel using your SIM card, the option of using a Personal Identity Number (PIN) is available. When enabled the option requires (on power up) a verification number to be entered via the unit's keypad, before the card can be used. Three attempts to enter the correct PIN may be made. If after the three entries the correct PIN has not been entered, the card becomes blocked. To unblock the card an unblocking/super PIN code must be entered. Ten attempts to enter the correct unblocking code are permitted, if after ten attempts the correct code has not been entered, the SIM card is corrupted and becomes useless.

Another option available for the SIM card is call barring. If subscribed to, the call barring of incoming and/or outgoing calls may be accomplished by entering a special key sequence. The key sequence includes a "barring code", which determines the type of restriction incorporated, and a password to validate the request. The initial password is provided when you subscribe to the service. The password can be changed by entering a set key sequence.

A valid standard sized SIM card can be used in any working GSM transceiver, regardless of the manufacturer, which is compatible with the standard size SIM card.

To protect the actual unit from unauthorized use, a lock function on the hardware is available. When enabled, this function requires that a three or four digit unlock code be ejtered, via the units keypad, before normal operation of the transceiver can take place. The lock code can be changed by entering a set key sequence.

Further information on set key sequences can be derived from the unit's User Guide.

Testing

Verification

Introduction

To test the GSM 8700/6700 cellular telephone for functional verification, the following equipment will be required:

- GSM compatible communications analyzer.
- Antenna test adaptor (Part No 5880348B33), and appropriate cable/ connectors.
- Test SIM card (Part No 8102430Z01).
- Charged battery pack.

Equipment Configuration

Initially insert the test SIM card into the slot at the rear of the personal cellular telephone. If required, further information on SIM card insertion is available on page 10. The telephone's antenna should now be removed, see "Disassembly" on page 21 for further details. When the antenna has been removed, attach the antenna adaptor to the unit. Slide a charged battery on to the back of the personal telephone, so that the telephone can be powered up. Finally, connect a cable from the antenna connector to the RF in/out port of the communications analyzer, and power both the analyzer and personal telephone on. The equipment set up shown in Figure 7: "Testing Configuration" should now be in place.

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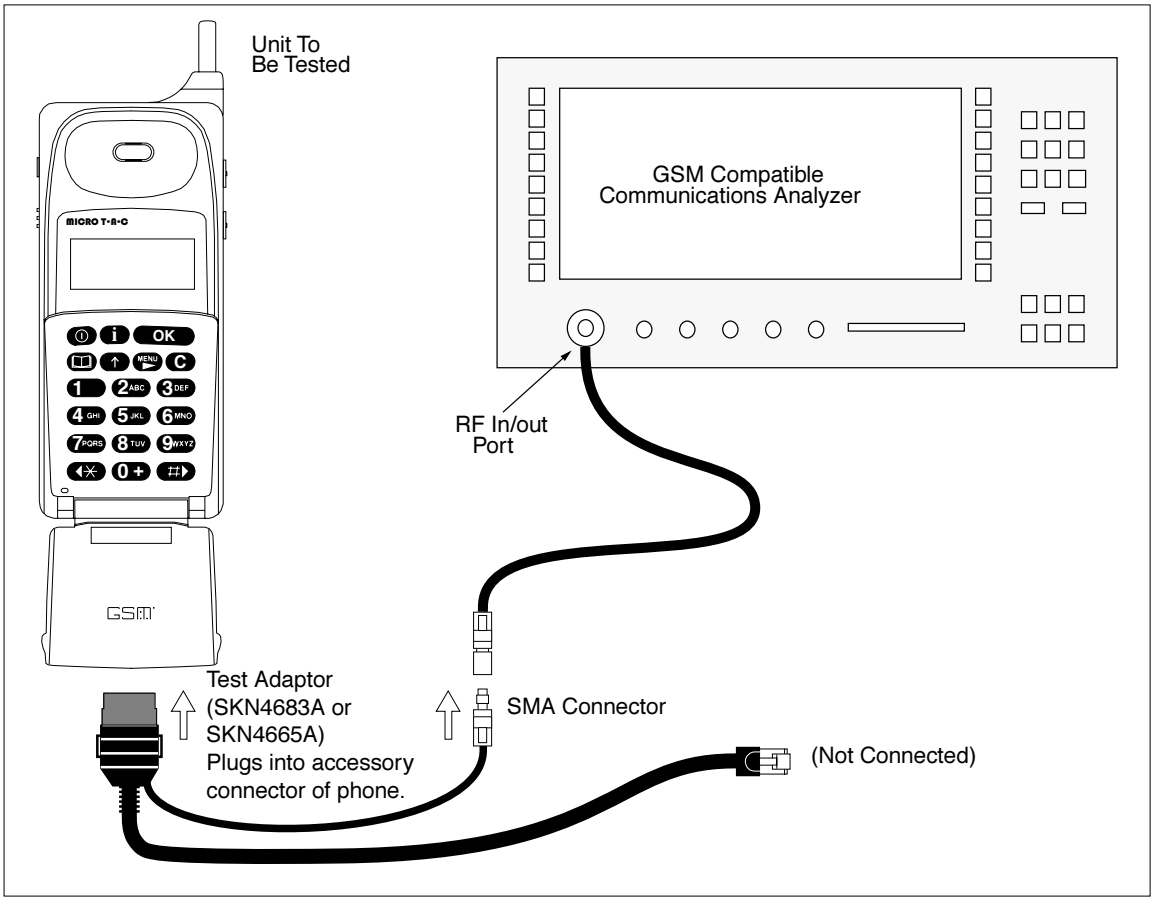
Figure 7: Testing Configuration



Manual Test Mode

Introduction

The Motorola GSM 8700/6700 personal cellular telephones are equipped with a Manual Test Mode capability. This capability allows service personnel to take control of the telephone, and by entering certain keypad sequences, make the telephone perform desired functions. To enter the Manual Test Mode, a Test SIM card (Part No 8102430Z01) is required.

Test SIM Card Insertion/removal

The Test SIM card must be inserted into the unit correctly to access Manual Test Mode. The whole SIM card should slide completely and securely into the slot at the base of the phone. Ensure that the contacts of the card face towards the front of the phone i.e. towards the flip. See "SIM Card Insertion/ Removal" on page 10.

The sliding, card release button will move upwards as the SIM card is inserted. When the button reaches the top of its recess and the card is flush with the base of the phone, it is inserted correctly. To remove the SIM card from the unit, push the sliding SIM card release button downwards.

The card will then be pushed out far enough to allow complete removal. The User Guide contains full information about inserting and removing the SIM card.

Accessing The Manual Test Mode

When the Test SIM card is in place, power up the telephone. Once the initial automatic 'wake up' sequence has taken place correctly, depress the # key (on the units keypad) for three seconds. After three seconds 'TEST' should appear in the display, indicating that the unit is now in the Manual Test Mode. Table 5: "GSM Test Commands" on page 15 shows the available Manual Test commands and their corresponding results.If a customer should forget the security code in their unit, it can only be read or changed by using a Test SIM card.

Table 5: GSM Test Commands

Key Sequence	Test Function/Name
#(hold down for 2 seconds)	Enter manual test mode
01#	Exit manual test mode
02xxyyy#	Display/modify TX power level DAC & load PA calibration table
03x#	DAI
05x#	Initiate Exec Error Handler Test
07x#	Mute RX audio path
08#	Unmute RX audio path
09#	Mute TX audio path
10#	Unmute TX audio path
11xxx#	Program main LO to channel
12xx#	Set TX power level to fixed value
13x#	Display memory block usage
14x#	Initiate Out of Memory condition
15x#	Generate tone
16#	Mute tone generator
19#	Display S/W version number of Call Processor
20#	Display S/W version number of Modem
22#	Display S/W version number of Speech Coder
24x#	Set step AGC
25xxx#	Set continuous AGC
26xxxx#	Set continuous AFC
31x#	Initiate Pseudo-Random Sequence- with Midamble
32#	Initiate RACH Burst Sequence
33xxx#	Synchronize to BCH carrier
34xxxyy#	Configuration to TCH/FS & Enable TCH loopback w/o Frame Ensure Indication
36#	Initiate acoustic loopback
37#	Stop test
38#	Activate SIM

Table 5: GSM Test Commands

Key Sequence	Test Function/Name
39#	Deactivate SIM
40#	Initiate sending all 1's
41#	Initiate sending all 0's
42#	Disable echo processing
43x#	Change audio path
45xxx#	Serving cell power level
46#	Display current value of AFC DAC
47x#	Set audio volume
51#	Enable sidetone
52#	Disable sidetone
57#	Initialize non-volatile memory
58#	Display security code
58xxxxxx#	Modify security code
59#	Display lock code
59xxx#	Modify lock code
60#	Display IMEI
61#	Display MCC portion of the LAI
61xxx#	Modify MCC portion of the LAI
62#	Display MNC portion of the LAI
62xx#	Modify MNC portion of the LAI
63#	Display LAC portion of the LAI
63xxxxx#	Modify LAC portion of the LAI
64#	Display Location Update Status
64x#	Modify Location Update Status
65#	Display IMSI
66xyyy#	Display/modify TMSI
67#	Zero PLMN Selector
68#	Zero forbidden PLMN list
69x#	Display/modify Cipher Key Sequence Number
70xxyyy#	Display/modify BCCH allocation table
71xx#	Display internal information
72xx#	Display Passive Fail codes
73xyyy#	Display/modify Logger Control Block
7536778#	Initiate transfer to Flash Memory

Personality Transfer

Introduction

Due to the different variations (OEM looks) of the GSM 8700/6700 personal cellular telephones, each main board must be configured correctly to ensure that the unit takes on the correct personality required. Therefore, when a main board is replaced its personality must be transferred into the new board, so that it functions correctly in the customers unit. There are two possible methods of transfer:

- Normal Transfer, and;
- Master Transfer.

If the defective unit powers up, then the Normal Transfer method should be followed. If the faulty unit will not power up, then a Master transfer will be required to configure the replacement board, once installed.

Normal Transfer

This method allows the personality, selected features and stored phone numbers of a defective radio, to be transferred into a repaired radio. Data is transferred from the donor unit into the recipient unit using a Transfer card (Part No 5104025D01). The instruction steps should be followed in order.

Step 1. Insert the Transfer card into the slot located on the back of the donor unit. Turn the donor unit on, the display should show 'Clone'.

Step 2. The donor unit is now in the cloning mode, and ready to transfer the first block of data.

Step 3. Enter **021#** via the units keypad. This command will cause the first block of information to be uploaded into the Transfer card.

Step 4. While data transfer is taking place between the unit and the card, 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the donor units display.

Step 5. When the first data block has been successfully uploaded, remove the card from the donor.

Step 6. Insert the Transfer card into the slot located on the back of the recipient unit. Turn the recipient unit on, the display should show 'Clone'.

Step 7. The recipient unit is now in the cloning mode, and ready to receive the first block of data.

Step 8. Enter **03#** via the units keypad. This command will cause the recipient unit to download the first data block from the Transfer card.

Step 9. While data transfer is taking place between the card and the unit, 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient units display.

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Step 10. The second data block must now be transferred. Repeat steps 1 to 9, but enter **022#** to program the second data block into the Transfer card.

Step 11. The third data block (known as table **5#**) must now be transferred. Repeat steps 1 to 9, but enter **025#** to program the third data block into the Transfer card.

Step 12. When the third block of data has been transferred successfully, remove the Transfer card and check the repaired radio functions correctly. See "Testing" on page 13.

Master Transfer

This method of transfer should only be followed when the defective unit will not power up, or complete a Normal Transfer. As mentioned earlier, there are different variations (OEM looks) of the Motorola GSM 8700/6700 cellular telephones, each model requiring the main board to be configured differently for correct operation. When carrying out a Master Transfer it is not possible to transfer the customers selected features or stored phone numbers, only the personality can be programmed into the repaired unit.

Each different version of the GSM 8700/6700 cellular telephone, has its own Master Transfer card which contains essential set up information. Master SIM cards may be ordered pre-programmed, or created from a Normal Transfer card. The instruction steps should be followed in order.

Step 1. Select the required Master SIM card.

Step 2. Insert the Master Transfer card into the slot located on the back of the repaired unit. Turn the unit on, the display should show 'Clone'.

Step 3. Enter **03#** via the units keypad. This command will cause the configuration data to be downloaded from the Master Transfer card.

Step 4. While data transfer is taking place between the card and the unit 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient units display.

Step 5. When the data block has been transferred successfully, remove the Master Transfer card and check the repaired radio functions correctly. See "Testing" on page 13.

At no point should either **021#** or **022#** be entered while a Master Transfer card is in the radio. If either of the stated commands are entered, the master information on the card will be erased. To prevent the above happening the card can be locked by entering **06#** via the units keypad, with the card inserted. Unlock the card by entering **07#**.

- If during either transfer process a problem arises, an error message will be displayed. If the Transfer card is removed before the data transfer is completed 'Bad Data on Card' will appear in the display. If either situation arises, the process should be repeated.

Disassembly

Introduction

Before disassembly is started, the antenna connector cap at the top of the phone has to be removed to allow full separation.

Reasonable care should be taken during the disassembly and reassembly of the unit in order to avoid damaging or stressing the housing and internal components. Ensure that a properly grounded high impedance conductive wrist strap is used while performing these procedures on electronic units.

CAUTION

Many of the integrated circuit devices used in this equipment are vulnerable to damage from static charges. Ensure that adequate static protection is in place when handling, shipping, and servicing the internal components of this equipment.

Recommended Tools

The following tools are recommended for use during the disassembly and reassembly of the phone.

- Anti-Static Mat Kit (01-80386A82); includes:
  - — Anti-Static Mat 66-80387A95
  - — Ground Cord 66-80334B36
  - — Wrist Band 42-80385A59
- Dental Pick
- Rear Housing Removal Tool 81-09972N01
- Plastic Prying Tool SLN7223A

Disassembly Procedure

The following information describes the procedure for removing and accessing various parts of the GSM 8700.

NOTE

Refer to Figure 10: “GSM 8700 Mechanical Explosion Illustration” on page 52, as necessary, while performing the disas-

Assembly Procedure

Once the unit is disassembled and the repair is carried out it then becomes obvious that to assemble the unit, the procedure is the reverse of that previously completed for disassembly.

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Antenna Removal

Step 1. Turn off the telephone.

Step 2. Press down on the battery's tab, slide down, and remove the battery from the housing.

Step 3. Carefully pry off the antenna cap using a plastic pry tool.

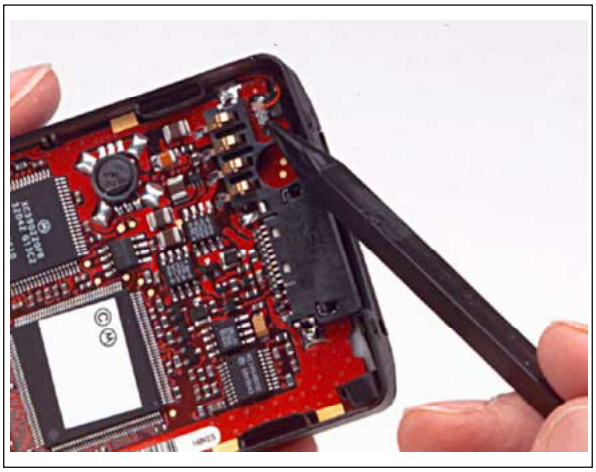
Step 4. Remove the antenna assembly by simply pulling it out of the housing. If it proves difficult to remove, remove it after separating the front and back housings.

Step 5. Align the unit on the rear housing removal tool. Pull the lever upwards to disengage the rear housing tabs from the front housing.

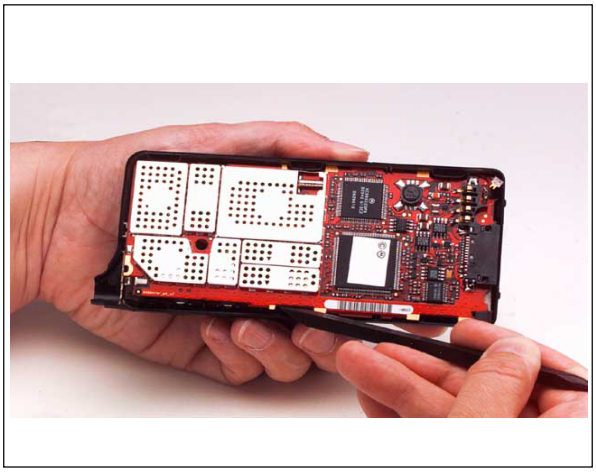
Board Removal

Step 1. The front housing, containing all the internal circuitry, can now be lifted away.

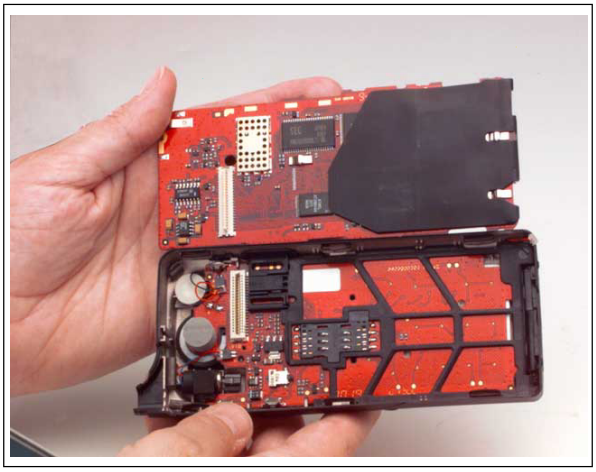
Step 2. Unclip the microphone plug using a plastic pry tool.



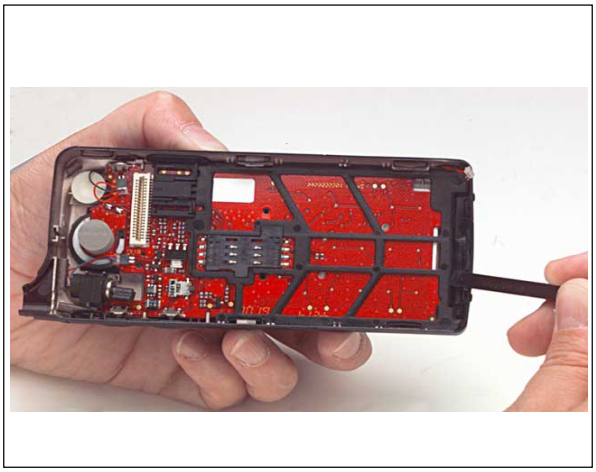
Step 3. Carefully ease the Logic/RF board away from the Keypad/Display board, which connects to it via a 41 pin plug/socket connector.



Step 4. The Logic/RF board can now be removed completely from the front housing.



Step 5. Carefully unclip the plastic slider plate, starting from the opposite side to the SIM card eject button.



Step 6. Pry out the Keypad/ Display board using a plastic bladed tool.

The Keypad and Display easily lift out of front housing.

Flip Removal

Step 1. To remove the flip, hold it fully open to expose the two slots on the shaft. Using a dental pick, locate the small holes on the hinge cams.

Push hinge cam in turn towards the center of the flip while easing the flip outwards.

Troubleshooting

Introduction

Assembly replacement level troubleshooting and repair of the GSM 8700/6700 personal telephone is limited to those components listed in the Replacement Parts List. See "Replacement Parts" on page 49.

It is recommended that known good replacement parts and assemblies be available to be used for troubleshooting by substitution, and for replacement of parts/assemblies found to be defective.

Troubleshooting And Repair

The troubleshooting information in Table 6, Table 7, and Table 8 shows some typical malfunction symptoms and the corresponding verification and repair procedures. Additionally, the "Troubleshooting Supplements" are offered to assist in corrective action of more detailed symptoms. Refer to the disassembly instructions located in "Disassembly" on page 21 for instructions on removing and replacing parts/assemblies from the personal telephone.

If the Logic/RF assembly is replaced a personality transfer will be necessary. See "Personality Transfer" on page 17.

NOTE

Defective Logic/RF assemblies must be replaced with pre-tested, pre-phased assemblies.

Testing After Repair

After any repair work has been carried out, the unit should be thoroughly tested to ensure that its operates correctly. This is especially important if the Logic/RF assembly is replaced.

For general repairs which do not include replacing the Logic/RF assembly, simply placing a call and checking signal strength, and transmit and receive audio quality is normally sufficient.

When the Logic/RF assembly is replaced, the unit must have a comprehensive test on a GSM compatible communications analyzers. See "Testing" on page 13 for further details. Placing a call on air is usually carried out at this stage to complete the testing procedure.

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Table 6: Receiver Troubleshooting and Repair Chart

RX Symptom	Probable Cause	Verification and Remedy
1. Portable telephone exhibits poor reception and/or erratic operation (such as calls frequently dropping, weak and/or distorted audio, etc.).	a) Antenna assembly is defective.	1. Check to make sure that the antenna pins are properly connected to the Logic/RF assembly. If OK, substitute a known good antenna assembly. 2. If the fault is still present, proceed to b.
	b) Defective or mis-phased RF/Audio-Logic Board.	1. Check for appropriate frequencies and power level gains/losses in the RX path. Reference RF Block Diagram. 2. Replace malfunctioning components if listed on parts list. Likely fail components are: FL420, FL451, FL452, Q418, Q420, Q421, and U400. 3. If parts replacement doesn't correct the fault, replace transceiver.
	c) Defective keypad board. (i.e. SEND key won't work)	1. Substitute keypad and logic board with a known good keypad and logic board. 2. If known good board works, place the keypad from the defective unit onto it and attempt to function. 3. If unit functions properly, replace the mylar barrier on the defective unit and then attempt to function defective unit with original keypad. 4. If fault persists, replace the logic board.
2. Receive audio is weak and/or distorted.	a) Connections to/from Keypad/Display circuit board defective.	1. Gain access to Keypad/Display board as described in "Disassembly" on page 21. 2. Check connection from earpiece to Keypad/Display circuit board. Make sure to check polarity and solderability. If connection is not at fault, proceed to b. 3. If Keypad/Display board is faulty, examine it for improper solder and/or connections. Likely fail components: J1101.
	b) Earpiece speaker defective.	1. Gain access to earpiece speaker as described in "Disassembly" on page 21. 2. Substitute a known good earpiece speaker. Place a call and verify improvement in earpiece audio. If good, re-assemble portable with new earpiece speaker. 3. If earpiece speaker not at fault, re-install original earpiece speaker and proceed to c.

Table 6: Receiver Troubleshooting and Repair Chart

RX Symptom	Probable Cause	Verification and Remedy
2. Receive audio is weak and/or distorted.	c) Antenna assembly is defective.	1. Check to make sure antenna pin is properly connected to the Logic/RF Board Assembly. If OK, substitute a known good antenna assembly. 2. If antenna assembly is not at fault, re-install original antenna assembly and proceed to d.
	d) Logic/RF Board Assembly defective.	1. Replace Logic/RF Board Assembly. 2. If substitute Logic/RF Board Assembly works, the original is faulty and should be examined for improper solder and/or connections. Likely fail components: J2, U701, U801, U803, U804, and U900.

Table 7: Transmitter Troubleshooting and Repair Chart

TX Symptom	Probable Cause	Verification and Remedy
1. Transmit audio is weak, (usually indicated by called parties complaining of difficulty in hearing voice from portable phone).	a) Microphone connections to Keypad/Display board defective.	1. Gain access to the Microphone as described in “Disassembly” on page 21. 2. Check connections (including checking for polarity) and if OK, proceed to b.
	b) Microphone defective.	1. Gain access to microphone (located on keypad membrane). 2. Disconnect and substitute a known good Microphone. 3. Place a call and verify improvement in portable transmit signal as heard by called party. If good, re-assemble portable with new Microphone. 4. If Microphone is not at fault, re-install original Microphone and proceed to c.
	c) Logic/RF Board Assembly defective.	1. Replace Logic/RF Board Assembly. 2. If Logic/RF Board Assembly is at fault, examine it for improper solder and connections. Likely fail components: Q300, Q301, Q302, Q381, U701, U801, U803, and U900.

Table 8: Logic/Processing Troubleshooting and Repair Chart

Logic/Processing Symptom	Probable Cause	Verification and Remedy
1. Unit Doesn't Turn On or Stay On	a) Battery either discharged or defective.	1. Measure battery voltage across a 50 ohm (>1 Watt) load. 2. If the battery voltage is <6 V DC, recharge the battery using the appropriate battery charger. 3. If the battery will not recharge, replace the battery. 4. If battery is not at fault, proceed to b.
	b) Battery connector open or misaligned.	1. Visually inspect the battery connectors on both the battery pack and the transceiver, including the solder connections from the battery connector to the main PC board. 2. Realign the contacts or, if necessary, replace either the battery or battery connector. Removing the battery connector assembly has to be done with extreme care to avoid damaging the PCB. 3. If battery connectors are not at fault, proceed to c.

Table 8: Logic/Processing Troubleshooting and Repair Chart

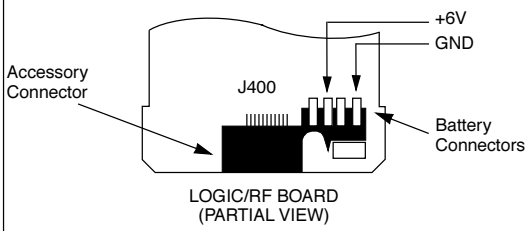
Logic/Processing Symptom	Probable Cause	Verification and Remedy
1. Unit Doesn't Turn On or Stay On	c) Defective RF/Audio-Logic Board assembly.	1. Gain access to Keypad/Display / main board as described in "Disassembly" on page 21. 2. Remove the Logic/RF Assembly. Substitute a known good assembly. 3. Temporarily connect a +6 V dc supply to the battery connectors as shown below. 4. Depress the **PWR** button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new Logic/RF Board assembly and refer to "Testing After Repair" on page 27. 5. If Logic/RF Board Assembly is not at fault, re-install original Logic/RF Board Assembly and proceed to d.  LOGIC/RF BOARD (PARTIAL VIEW)
	d) Keypad/Display circuit board failure.	1. Replace the Keypad/Display board. 2. Temporarily connect a +6 V dc supply to the battery connectors as shown above. 3. Depress the **PWR** button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new Keypad/Display board.
2. Display is erratic, or provides partial or no display.	a) Mating connections to/from Keypad/Display board faulty.	1. Gain access to Keypad/Display / main board as described in "Disassembly" on page 21. If connections are faulty then replace the connector(s) as necessary. 2. If connections are not at fault proceed to b.
	b) Keypad/Display board defective.	1. Substitute a known good Keypad/Display circuit board. If known board works, the original is faulty and should be examined for improper solder and/or connections. Likely fail components: J1101.

Table 8: Logic/Processing Troubleshooting and Repair Chart

Logic/Processing Symptom	Probable Cause	Verification and Remedy
2. Display is erratic, or provides partial or no display.	c) Logic/RF Board Assembly defective.	1. Substitute a known good Logic/RF Assembly. 2. If known assembly works, the original is faulty and should be examined for improper solder and/or connections. Likely fail components: J1101, J2, Q102, Q104, U101, and U701.
3. Incoming call alert transducer audio distorted or volume is too low.	a) Connections to/from Keypad/Display circuit board faulty.	1. Gain access to Keypad/Display board as described in “Disassembly” on page 21. 2. Check connection from alert transducer and from the Keypad/Display board to the Logic/RF assembly. 3. If connection not at fault, proceed to b.
	b) Alert transducer defective.	1. Gain access to alert speaker as described in “Disassembly” on page 21. 2. Disconnect the alert speaker. 3. Connect a known good alert speaker. 4. Place call to portable telephone from land-line or other mobile/portable telephone and verify alert signal volume and clarity. If good, re-assemble portable with new alert speaker. 5. If alert speaker not at fault, re-install original alert speaker and proceed to c.
	c) Keypad/Display board assembly defective.	1. Replace Keypad/Display board. 2. If Keypad/Display board is not at fault, re-install original Keypad/Display board and proceed to d. 3. If Keypad/Display board is at fault, examine it for improper solder and/or connections. Likely fail components: J1101.
	d) Logic/RF Board Assembly defective.	1. Replace Logic/RF Board Assembly. 2. If Logic/RF Board Assembly is at fault, examine it for improper solder and/or connections. Likely fail components: J2, U801, U803, and U900.

Table 8: Logic/Processing Troubleshooting and Repair Chart

Logic/Processing Symptom	Probable Cause	Verification and Remedy
4. Phone will not recognize/ accept SIM card	a) SIM card defective	1. Initially check that the contacts on the card are not dirty; clean if necessary, and check if fault has been eliminated. 2. If the contacts are clean, insert a known good SIM card into the portable telephone. Power up the unit and confirm whether or not the card has been accepted. If the fault no longer exists, the defective SIM card should be replaced. 3. If the SIM card is not at fault, proceed to b.
	b) SIM card retaining assembly defective or mis-aligned.	1. Gain access to the retaining assembly as described in “Disassembly” on page 21. 2. Examine for defects and replace if necessary.
	c) Keypad/Display Board defective.	1. Replace Keypad/Display Board with a known good board. If good board works, original is faulty. 2. Examine the original Keypad/Display Board for improper solder and/or connection. Likely fail components: J1101, J1601, S1602, and U1701.
	d) Logic/RF Board Assembly defective.	1. Replace Logic/RF Board Assembly with a known good board. If good board works, original is faulty. 2. Examine the original Logic/RF Board Assembly for improper solder and/or connection. Likely fail components: J2.
5. Hinged mouth-piece does not go on/off hook correctly (usually indicated by inability to answer incoming calls by flipping the mouthpiece down, or inability to make outgoing calls).	a) Reed switch defective.	1. Gain access to Keypad/Display board as described in “Disassembly” on page 21. 2. Unsolder the reed switch and replace with a known good one. 3. Reassemble unit. 4. Place call to portable phone and verify ability to answer by opening flip. 5. If fault still present, replace original reed switch and proceed to b.

Table 8: Logic/Processing Troubleshooting and Repair Chart

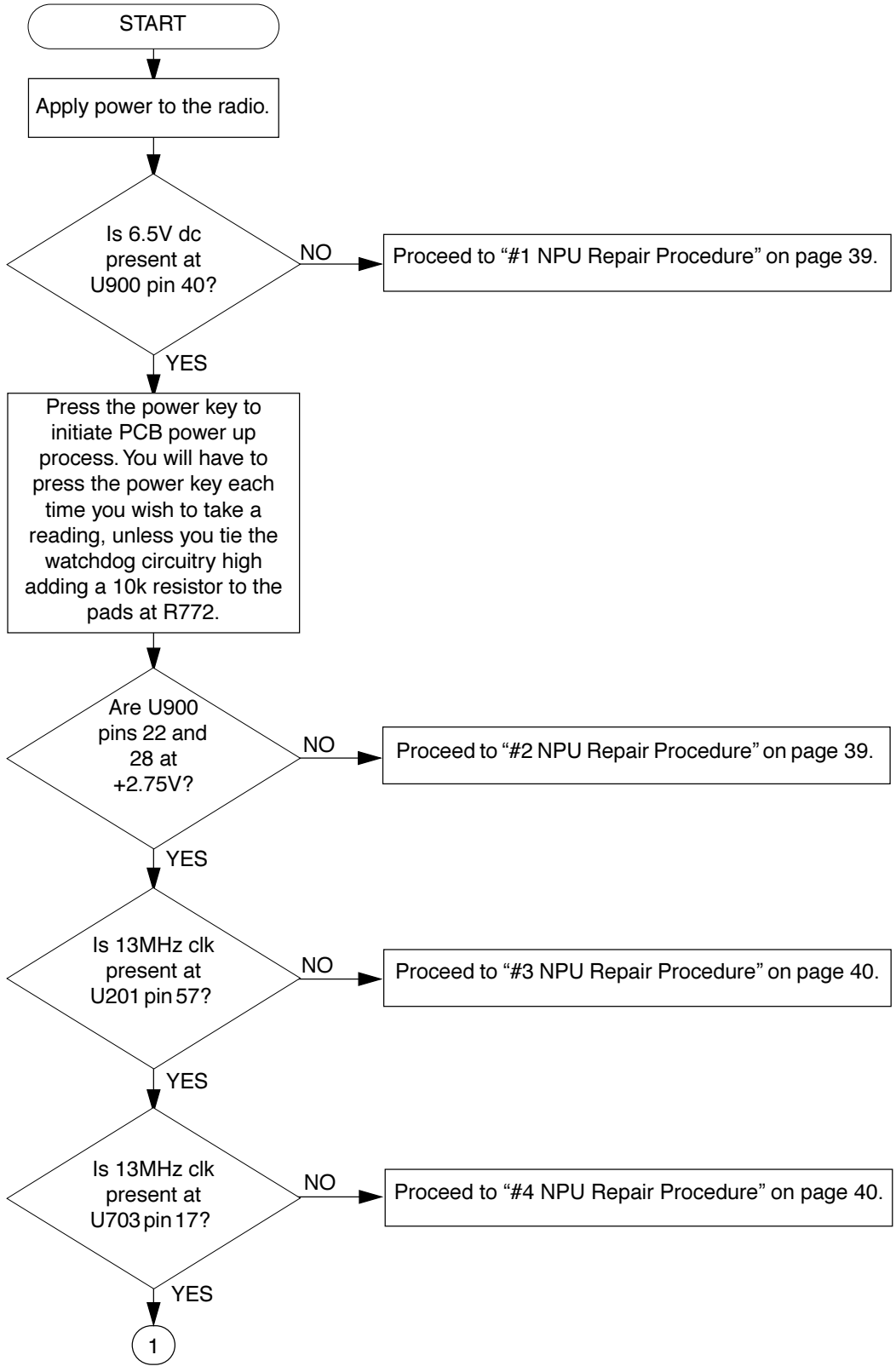
Logic/Processing Symptom	Probable Cause	Verification and Remedy
5. Hinged mouthpiece does not go on/off hook correctly.	b) Magnet in flip defective.	1. Replace flip assembly with known good one. 2. Place call to portable phone and verify ability to answer by opening flip. 3. If fault still present, replace original flip assembly and proceed to c.
	c) Keypad/Display board defective.	1. Replace the Keypad/Display board with a known good one. 2. Place call to portable phone and verify that the fault has been eliminated. 3. If original Keypad/Display board is at fault, examine it for improper solder and/or connections. Likely fail components: J1101.
	d) Logic/RF Board Assembly defective.	1. Replace the Logic/RF board with a known good one. 2. Place call to phone and verify that the fault has been eliminated. 3. If original Logic/RF Board Assembly is at fault, examine it for improper solder and/or connections. Likely fail components: C905, and J2.
6. Vibrator feature not functioning.	a) Vibrator motor defective.	1. Gain access to Keypad/Display board as described in “Disassembly” on page 21. 2. Check connections, if OK unsolder the supply wires to the motor and unclip the motor from the board. 3. Replace the motor with a known good one. Reassemble unit. 4. Place call to portable phone and verify vibrator feature functions. 5. If fault still present, replace original vibrator motor and proceed to b.
	b) Keypad/Display board defective.	1. Replace the Keypad/Display board with a known good one. 2. Place call to portable phone and verify that the fault has been eliminated. 3. If original Keypad/Display board is at fault, examine it for improper solder and/or connections. Likely fail components: J1101, Q1800, and Q1801.

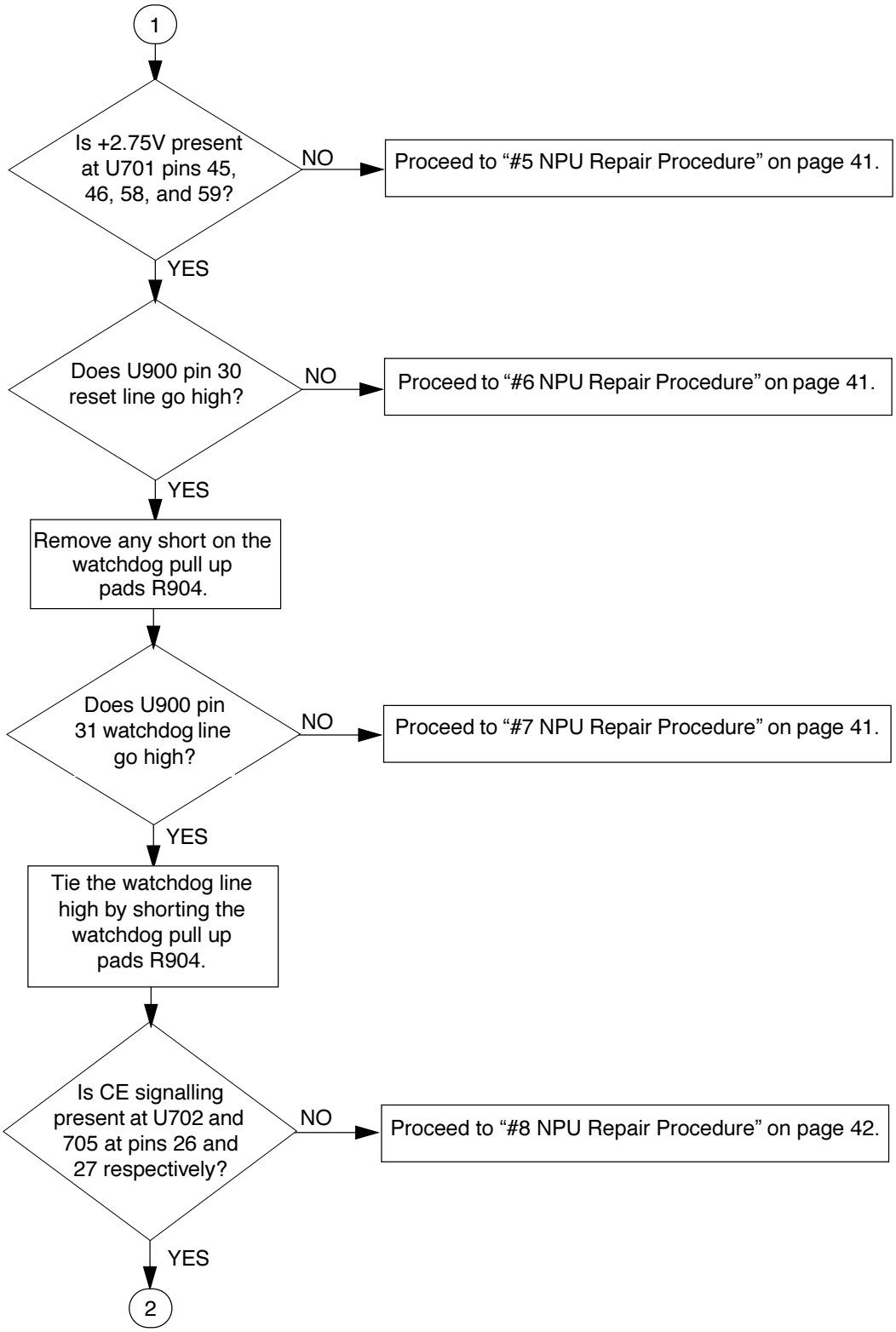
Table 8: Logic/Processing Troubleshooting and Repair Chart

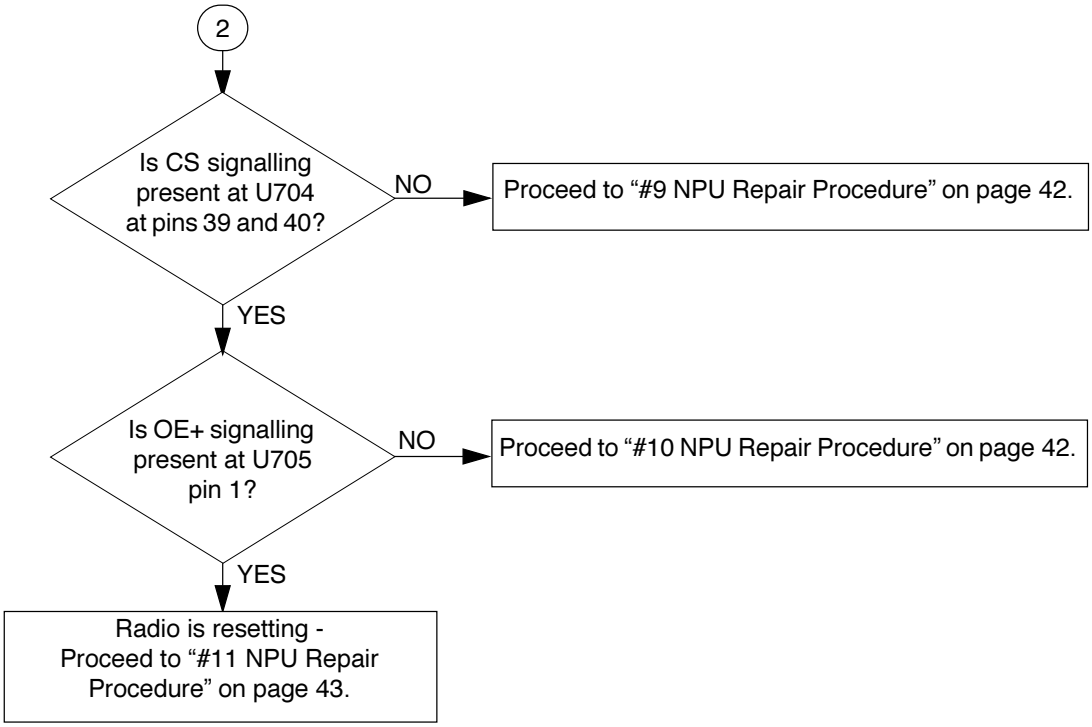
Logic/Processing Symptom	Probable Cause	Verification and Remedy
6. Vibrator feature not functioning.	c) Logic/RF Board Assembly defective.	1. Replace Logic/RF Board Assembly. 2. Place call to portable phone and verify that the fault has been eliminated. 3. If Logic/RF Board Assembly is at fault, examine it for improper solder and/or connections. Likely fail components: J2, and U701.

Troubleshooting Supplements

Logic/Processing Supplement 1 - Unit Doesn't Power Up (NPU)


START
Apply power to the radio.
Is 6.5V dc present at U900 pin 40?
NO
Proceed to "#1 NPU Repair Procedure" on page 39.
YES
Press the power key to initiate PCB power up process. You will have to press the power key each time you wish to take a reading, unless you tie the watchdog circuitry high adding a 10k resistor to the pads at R772.
Are U900 pins 22 and 28 at +2.75V?
NO
Proceed to "#2 NPU Repair Procedure" on page 39.
YES
Is 13MHz clk present at U201 pin 57?
NO
Proceed to "#3 NPU Repair Procedure" on page 40.
YES
Is 13MHz clk present at U703 pin 17?
NO
Proceed to "#4 NPU Repair Procedure" on page 40.
YES
1


1
Is +2.75V present at U701 pins 45, 46, 58, and 59?
NO
Proceed to "#5 NPU Repair Procedure" on page 41.
YES
Does U900 pin 30 reset line go high?
NO
Proceed to "#6 NPU Repair Procedure" on page 41.
YES
Remove any short on the watchdog pull up pads R904.
Does U900 pin 31 watchdog line go high?
NO
Proceed to "#7 NPU Repair Procedure" on page 41.
YES
Tie the watchdog line high by shorting the watchdog pull up pads R904.
Is CE signalling present at U702 and 705 at pins 26 and 27 respectively?
NO
Proceed to "#8 NPU Repair Procedure" on page 42.
YES
2


2
Is CS signalling present at U704 at pins 39 and 40?
NO
Proceed to "#9 NPU Repair Procedure" on page 42.
YES
Is OE+ signalling present at U705 pin 1?
NO
Proceed to "#10 NPU Repair Procedure" on page 42.
YES
Radio is resetting - Proceed to "#11 NPU Repair Procedure" on page 43.

#1 NPU Repair Procedure

No +6.5V dc battery supply voltage present at pin 40 of U900.

- Check the PCB battery contact assembly for dry joints to the PCB, or broken contacts. Resolder any dry joints, or replace the battery contact assembly if any of the contacts are broken.
- Check the PCB external connector J400 socket on or around pin 2 for dry joints to the PCB or broken contacts.
- Check for +6.5Vdc at pin 40, U900 both with battery and external power. If no B+ with battery check Q999. If no B+ with external power, check CR998.

If replacing the above components does not eliminate the fault, return the PCB to a Motorola Hi Tech Center.

#2 NPU Repair Procedure

No regulated +2.75V dc voltage present at U900 pins 22 and 28.

The components that will most likely affect the regulated +2.75V supply are the B+ supply, and U900. Check that B+ related components are not physically damaged, have no dry joints, and are positioned correctly.

If none of the above mentioned problems are apparent, you can either take measurements on the defective PCB to decipher which component(s) you feel should be replaced, or replace the following components in the order shown:

1st - Replace T900

2nd - Replace U900

- Check the PCB after each component change to verify fault elimination.

If replacing the above components does not eliminate the fault, return the PCB to a Motorola Hi Tech Center.

#3 NPU Repair Procedure

No 13MHz reference clock signal at pin 57 of U201.

The components that will most likely affect the 13MHz reference clock are C201, C203, CR201, U201, and Y201. Check that the mentioned components are not physically damaged, have no dry joints, and are positioned correctly.

If none of the mentioned problems are apparent, take measurements on the defective PCB to decipher which component(s) you feel should be replaced, or replace the following components in the order shown:

1st - Replace Y201

2nd - Replace C203

3rd - Replace CR201

4th - Replace C201

- Check the PCB after each component change to verify fault elimination.

If replacing the above components does not eliminate the fault, return the PCB to a Motorola Hi Tech Center.

#4 NPU Repair Procedure

No 13MHz reference clock signal at pin 17 of U703.

- Review the audio logic block diagram which shows the path of the 13MHz clock.
- Confirm 13MHz clock signal presence at U703, pin 37.
- Confirm 13MHz clock signal presence at U501, pin 42.
- Confirm 13MHz clock signal presence at U805 pin 2.
- Confirm 26MHz clock signal presence at U805 pin 6 and U801 pin 37.
- Confirm 13MHz clock signal presence at U701 pin 51.

If the 13MHz clock enters U703 but does not appear at the output (pin 37), inspect the chip for physical damage, dry joints and correct position. If none of the mentioned problems are apparent, ensure that the supply voltage to the chip is present (see appropriate chip diagram). If present, replace the chip.

If the clock signal is present at U703 pin 37, but not present at any of the other aforementioned chips, ohm the path from that chip back to U703 pin 37. If the trace is functional, check the chip in question for supply voltage.

If no supply voltage to the chip, trace its B+ path and/or replace the chip. If after replacing all of the above components the fault is not eliminated, return the PCB to a Motorola Hi Tech Center.

#5 NPU Repair Procedure

The +2.75V dc supply is missing at one or more of pins 45, 46, 58, and 59 of U701.

Pins 45, 46, 58, and 59 are each fed via pull up resistors, R739, R746, R738, and R734 respectively.

- Check that all the pull up resistors are present, not physically damaged and that there are no dry joints on either the resistors or U701.

If after replacing the above components the fault is not eliminated, return the PCB to a Motorola Hi Tech Center.

#6 NPU Repair Procedure

The reset line at pin 30 of U900 does not go high to +2.75V dc.

- Check that U900 is not physically damaged, has no dry joints, and is positioned correctly. If none of the mentioned problems are apparent replace U900.

If replacing U900 the fault is still apparent return PCB to a Motorola Hi Tech Center.

#7 NPU Repair Procedure

The watchdog line at pin 31 of U900 does not go high to +2.75V dc.

The watchdog line is pulled high by U701 when it receives and executes the initial blocks of software from the PROM's U702 and U705. If there is a problem with either U701, U702, U704, or U705 the watchdog will not be pulled high. This will cause U900 to power down the +2.75V regulator's and halt the power up process.

- Check the CE lines at pins 26 and 27 of U702 and U705 respectively for activity.
- If there is no activity, proceed to NPU repair procedure 8.
- If above activity is present, check for activity at pin 39 and 40 of U704.
- If there is no activity, proceed to NPU repair procedure 9.
- If above activity is present, check the OE+ line at pin 1 of U705 for activity.
- If there is no activity, proceed to NPU repair procedure 10.

If the above procedures don't eliminate the fault, return the PCB to a Motorola Hi Tech Center.

#8 NPU Repair Procedure

No CE signalling present at pin 26 and 27 of U702 and U705 respectively.

If there are no CE (chip enable) pulses being sent from U701 to the software chips U702 and U705 it means that U701 is not trying to communicate with the EPROMs.

- Check that U701, U702 and U705 are not physically damaged, have no dry joints and are positioned correctly. If none of the mentioned problems are apparent, replace U702 and U705.

If replacing the above components does not eliminate the fault, return the PCB to a Motorola Hi Tech Center.

#9 NPU Repair Procedure

No signalling present at pins 39 and 40 of U704.

If there are no RAM1CS or RAM2CS (1&2 chip select) pulses being sent from U701 to the SRAM chip U704, it means that there is a problem in communication between U701 and the RAM.

- Check that U701, and U704 are not physically damaged, have no dry joints and are positioned correctly. If none of the mentioned problems are apparent, replace U704.

If after replacing all the above components the fault is still apparent, return PCB to a Motorola Hi Tech Center.

#10 NPU Repair Procedure

No OE+ signalling present at pin 1 U705.

If there are no ROM2OE pulses being sent to the EEPROM U705, it means that there is a problem in communication between U701 and the EEPROM.

- Check that U701 and U705 are not physically damaged, have no dry joints, and are positioned correctly. If none of the mentioned problems are apparent, replace U705.

If after replacing the mentioned chips the fault is still apparent return the PCB to a Motorola Hi Tech Center.

#11 NPU Repair Procedure

Radio is resetting.

If the radio executes external device communication and then powers itself down very shortly after attempting power up, it is resetting. A reset can be caused by a fault on either U801, U701 or U501.

- Check that U801, U701 and U501 are not physically damaged, have no dry joints, and are positioned correctly. If none of the mentioned problems are apparent.
- Ensure that the watchdog pull up pads R904 are shorted together, and monitor U801, U701 and U501 to see if any become warmer than the other components (U801 and U501 are the most likely). Should any of the mentioned components become warmer— replace it.

If the above information does not pin point a specific component, replace the following components in the order shown:

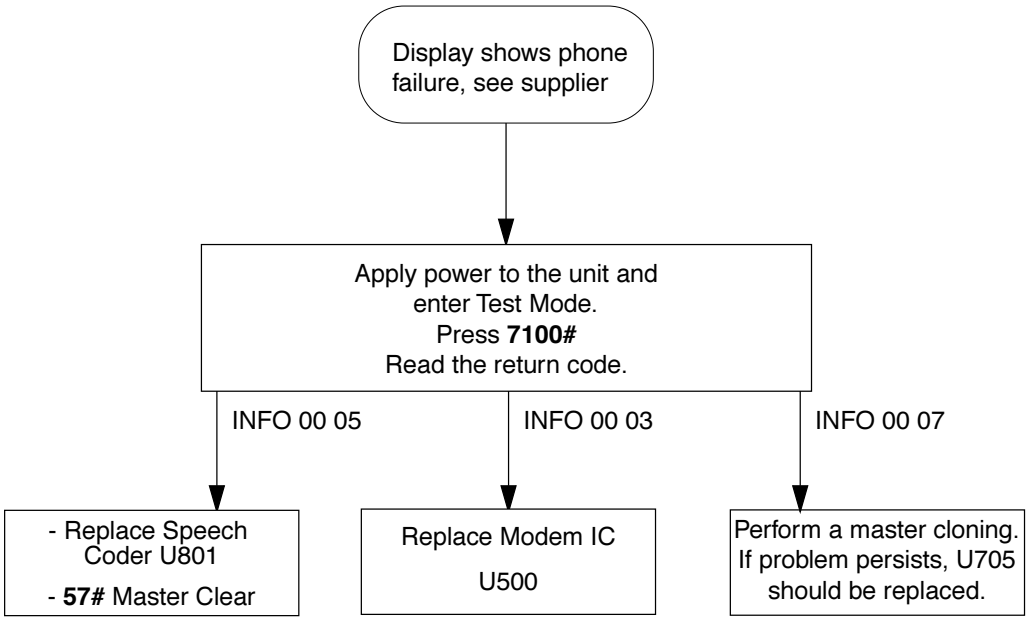
1st - Replace U801

2nd - Replace U501

- Check the PCB after each component change, to verify whether or not the fault has been eliminated.

If after replacing the two components the fault is still apparent return PCB to a Motorola Hi Tech Center.

Logic/Processing Supplement 3 - Phone Failure "See Supplier"


Display shows phone failure, see supplier
Apply power to the unit and enter Test Mode.
Press **7100#**
Read the return code.
INFO 00 05
INFO 00 03
INFO 00 07
- Replace Speech Coder U801
- **57#** Master Clear
Replace Modem IC
U500
Perform a master cloning. If problem persists, U705 should be replaced.

If problem still exists, replace the RF / Logic Board**.**

Logic/Processing Supplement 4 - Unit Powers Down When Twisted

This indicates possibilities of a dry/cold solder joint that normally makes contact. However, when the PCB is twisted or flexed the contact is broken causing power down. Inspect the following components for dry joints:

- J1101 connector to Display board
- J1201 display connector
- Battery contact assembly
- External device connector assembly (J400)
- Y201
- CR201
- All chips

If the above analysis does not identify the fault, return the PCB to a Motorola Hi Tech Center.

Logic/Processing Supplement 5 - PCB Draws Current When Off

- Ensure that the +6.5V power supply is being applied to the PCB , and that the PCB is switched off.
- Spray the top RF/Logic circuitry with freezer spray until the PCB is frosted white. If the frost melts on a specific component(s) before the normal defrost process occurs, replace the component(s).
- If the above process does not eliminate the fault, spray the bottom RF/Logic circuitry with freezer spray until the PCB is frosted white. Once again, if the frost melts on a specific component(s) before the normal defrost process occurs, replace the component(s).
- If steps 2 and 3 fail to eliminate the fault, or the defective component(s) are not covered by this level of repair, return the PCB to a Motorola Hi Tech Center.

Figure 8: RF Block Diagram

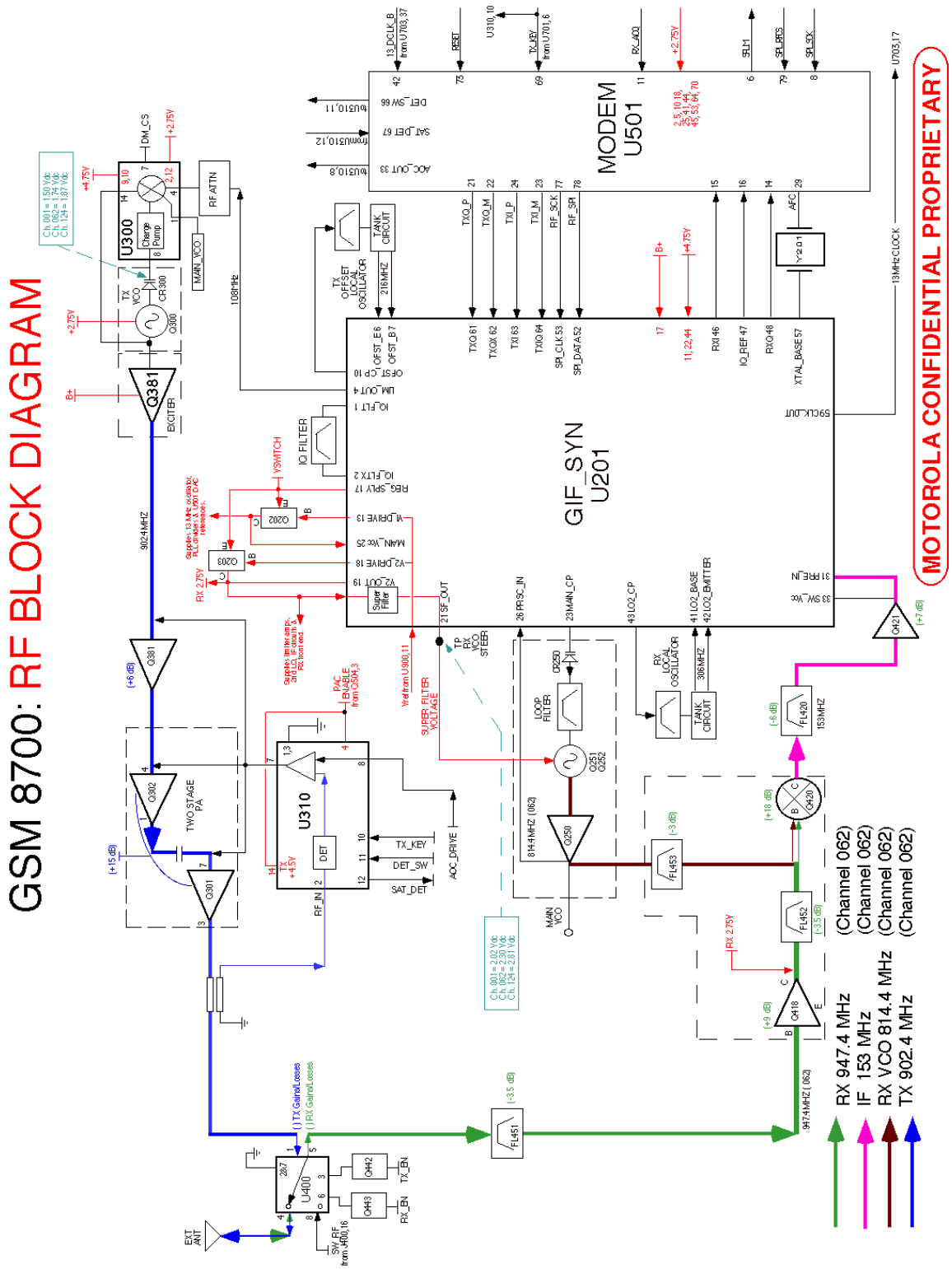
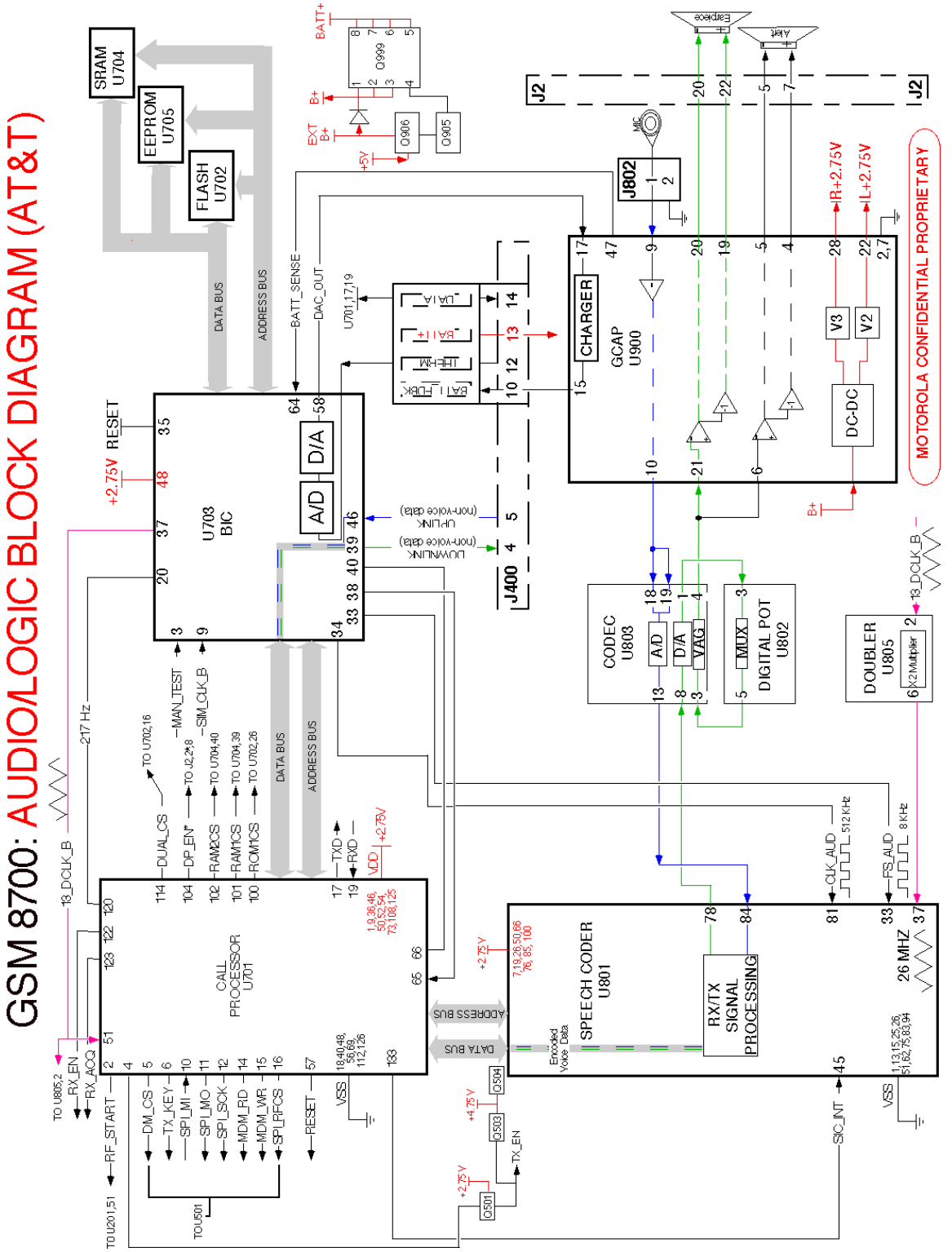


Figure 9: Audio-Logic Functional Block Diagram



Replacement Parts

GSM 8700 Electrical

Table 9: Replacement Parts List

Suffix	Description	Part Number
C202	CAPACITOR 150pF	2113740F57
C203	CAPACITOR	2113740F43
C904, C905	CAPACITOR 33 μF, CAPACITOR 0.1 μF	2113740F27, 2113743E20
CR201	DIODE	4809641F04
CR998	DIODE	4809653F02
FL420	FILTER	9109449C01
FL451, FL452	FILTER	9109123R01
J2	41 PIN PLUG	2809882L05
J400	CONNECTOR RECEPTACLE	0909958J04
J1101	41 PIN RECEPT.	0909883L04
J1601	SIM CONTACT RDR	0109505C10
J802	MIC SMD RECEPT.	0909888M01
Q102	TRANSISTOR	4813823A07
Q104	TRANSISTOR	4809579E09
Q300	TRANSISTOR	4803827A02
Q301 Q302	TRANSISTOR, TRANSISTOR	4809703N01, 4813827M40
Q381	TRANSISTOR	4883477R07
Q418	TRANSISTOR	4809527E20
Q420	TRANSISTOR	4809940E01
Q421	TRANSISTOR	4809940E01
Q442, Q443	TRANSISTOR	4809939C08
Q905, Q906	TRANSISTOR	4809607E02
Q998	TRANSISTOR	4809579E04
Q1800	TRANSISTOR	4813824A10
Q1801	TRANSISTOR	4883533T03
R734, R738, R739, R746	RESISTOR	0660076N77
S1602	SIM PRESENCE DETECT	4009608M03
U101	DOUBLER IC	5109920D12

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Table 9: Replacement Parts List

Suffix	Description	Part Number
U201	IC GIF SYN	5109632D64
U300	TIC IC	5109632D34
U310	PAC IC	5109632D08
U400	RF SWITCH	5109572E03
U501	IC	5109632D42
U702	FLASH PROM BLANK IC	5199245A01
U703	BIC IC	5109743E12
U704	SRAM IC	5109509A06
U801	DSP 1616 IC	5199233C05
U802	POTENTIOMETER	5109632D44
U803	CODEC	5109920D06
U804	MUX/DEMUX	5109522E10
U805	CLOCK DOUBLER	5109781E47
U900	GCAP IC	5109632D54
U1701	5V REG.	5109781E50
VR602 & 3	DIODE	4813830M25
Y201	CRYSTAL 13MHZ	4809813J02

GSM 8700 Mechanical

Table 10: GSM 8700 Replacement Parts List

Ref. No	Motorola Part No	Description
1	SUF3839A	GSM 8700 Transceiver
2	SAF5170A	Antenna w/No 3 cap
3	0109189C01	Antenna Assembly
4	3809686N03	Antenna Cap
5	SHN6106A	Housing and Hardware front
6	0109124B06	Card Holder
7	0109222S02	Vibrator Motor w/Gasket Assembly
8	0109429C02	Front Housing Assembly
9	1509431C02	Housing, Flip
10	1509432C02	Housing, Front
11	2209667M03	Bushing, Flip
12	3209317S01	Felt, Dynamic Speaker
13	3209440C01	Gasket, Dust

Table 10: GSM 8700 Replacement Parts List

Ref. No	Motorola Part No	Description
14	3209523A05	Gasket, Conductive
15	3809456C01	Button, Mute
16	3809460C01	Button, Volume
17	4183879P27	Spring
18	4709267J01	Cam, Right Tilling
19	4709267J02	Cam, Left Tilling
20	5409849N04	Decal, Magnet
21	5983583N17	Magnet
22	3209319S01	Grommet, MIC Conductive
23	3809917N07	Actuator Keypad GSM 8700
24	5009536H11	MIC Leaded w/Chip Cap
25	5009776E14	Alert Ringer Assembly Mag 2 Tone
26	N/A	Gasket, Alert
27	N/A	Cushion, Alert
28	6109441C02	Lens
29	SHN6151A	Housing & Hardware PNTD Rear
30	0109850N05	Assy, Housing Painted Rear
31	1509687N01	Rear Housing
32	1509618K03	Housing Tube
33	3209523A05	Gasket Conductive
34	4209852N02	Ground Clips
35	SLF6400A	8700 Transceiver Board
36	0109025A43	8700XCVR Top Side
37	0909958J04	Recp 10 Pins W/Batt
38	SYN5044A	8700 Backend Material
39	3509133B05	Mylar Cover
40	SYN5045	8700Keypad Board
41	5009076E02	Speaker, Dynamic Earpiece 20mm
42	7209005C05	LCD Display Module 96x32 Pixel
43	7509326S01	Cushion PCB Dynamic Speaker
44	5409276E01	8700 Molded Escutcheon

Figure 10 GSM 8700 Mechanical Explosion Illustration

GSM 6700 Electrical

Table 11: GSM 6700 Replacement Parts List

Suffix	Description	Part Number
C202	CAPACITOR 150pF	2113740F57
C203	CAPACITOR	2113740F43
C904, C905	CAPACITOR 33 μF, CAPACITOR 0.1 μF	2113740F27, 2113743E20
CR201	DIODE	4809641F04
CR998	DIODE	4809653F02
FL420	FILTER	9109449C01
FL451, FL452	FILTER	9109123R01
J2	41 PIN PLUG	2809882L05
J400	CONNECTOR RECEPTACLE	0909958J04
J1101	41 PIN RECEPT.	0909883L04
J1601	SIM CONTACT RDR	0109505C10
J802	MIC SMD RECEPT.	0909888M01
Q102	TRANSISTOR	4813823A07
Q104	TRANSISTOR	4809579E09
Q300	TRANSISTOR	4803827A02
Q301 Q302	TRANSISTOR, TRANSISTOR	4809703N01, 4813827M40
Q381	TRANSISTOR	4883477R07
Q418	TRANSISTOR	4809527E20
Q420	TRANSISTOR	4809940E01
Q421	TRANSISTOR	4809940E01
Q442, Q443	TRANSISTOR	4809939C08
Q905, Q906	TRANSISTOR	4809607E02
Q998	TRANSISTOR	4809579E04
Q1800	TRANSISTOR	4813824A10
Q1801	TRANSISTOR	4883533T03
R734, R738, R739, R746	RESISTOR	0660076N77
S1602	SIM PRESENCE DETECT	4009608M03
U101	DOUBLER IC	5109920D12
U201	IC GIF SYN	5109632D64
U300	TIC IC	5109632D34
U310	PAC IC	5109632D08
U400	RF SWITCH	5109572E03
U501	IC	5109632D42
U702	FLASH PROM BLANK IC	5199245A01
U703	BIC IC	5109743E12
U704	SRAM IC	5109509A06
U801	DSP 1616 IC	5199233C05

Table 11: GSM 6700 Replacement Parts List

Suffix	Description	Part Number
U802	POTENTIOMETER	5109632D44
U803	CODEC	5109920D06
U804	MUX/DEMUX	5109522E10
U805	CLOCK DOUBLER	5109781E47
U900	GCAP IC	5109632D54
U1701	5V REG.	5109781E50
VR602 & 3	DIODE	4813830M25
Y201	CRYSTAL 13MHZ	4809813J02

GSM 6700 Mechanical

Table 12: GSM 6700 Replacement Parts List

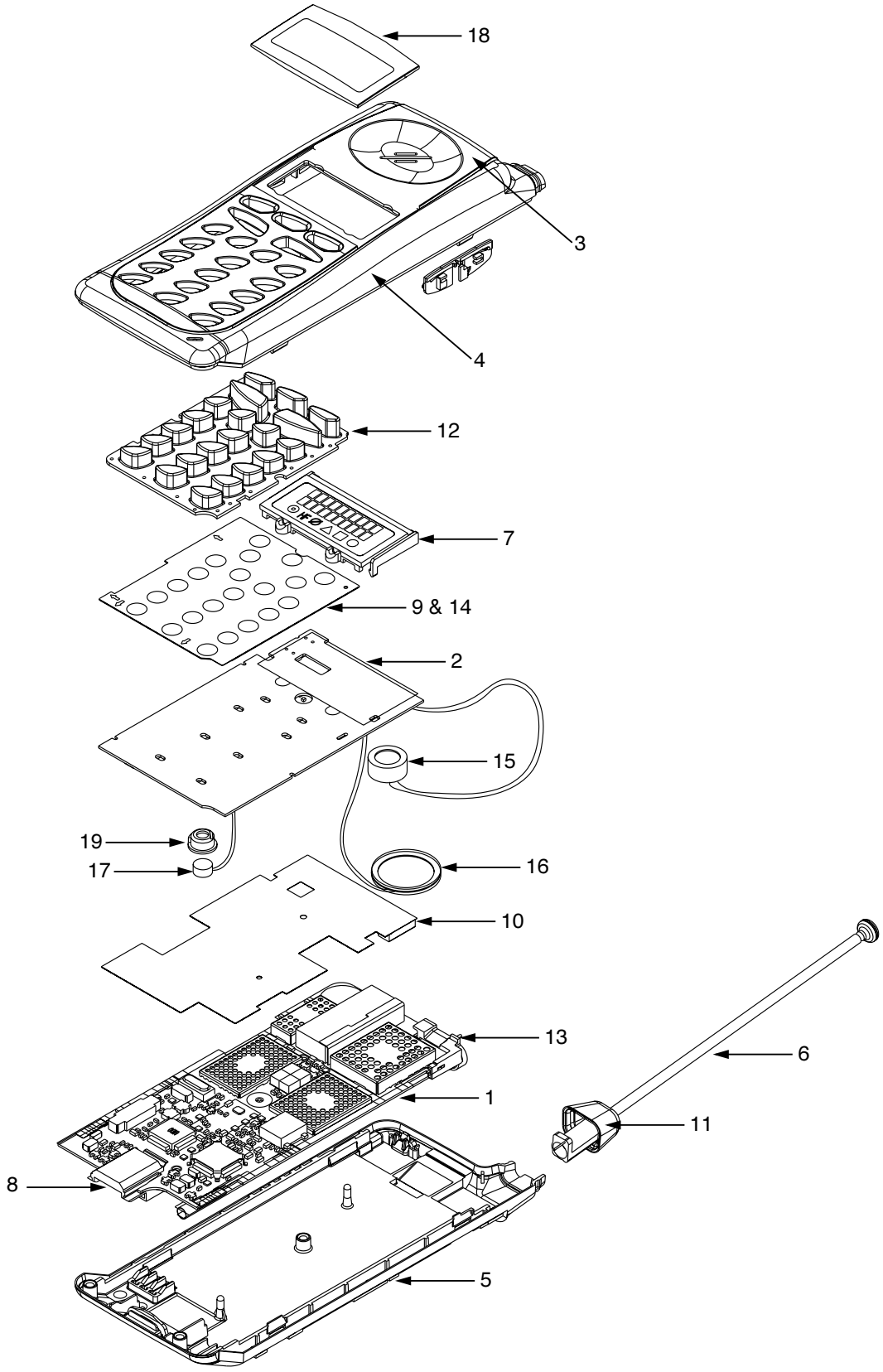
Ref. No	Motorola Part No	Description
	SUF3997A	GSM 6700 Transceiver
1	TBD	Spare Main Board
2	TBD	Spare Keyboard
3	0109006J21	Bezel Plum Look GSM 6700
4	0109165B15	Front Housing Assembly
5	0109166B08	Rear Housing Assembly
6	0109189C01	GSM Antenna Assembly
7	0109451B05	Display DCS/PCS/6700
*	0109505C10	SIM Carder Reader Contact Assembly
*	0310944A05	Screw, intstrpan
*	0310944A70	Screw, phosoil
8	0909958J04	External Connector
*	3209158B01	Gasket, RF
9	3509013R01	Mylar (clear) dust shield
10	3509133B05	Mylar (black) cover
11	3809074B01	Antenna cap
12	3809298J01	Keypad, Plum Look GSM 6700
13	3909014B01	Antenna Recp. Contact
14	4009184B01	Switch, keypad dome
*	4009394B01	Switch, tact spst 12V
*	4009608M03	Switch, SMT Card Reader Presence
*	4109083R02	Switch, compression

Table 12: GSM 6700 Replacement Parts List

Ref. No	Motorola Part No	Description
*	4109492C01	Gizmo GRND CLI
15	5009157R01	Transducer Alert
16	5009373D01	Speaker
17	5009536H11	MIC Leaded w/Chip Cap
*	5402139T03	Flare/Ultralite Label
18	6109071B01	Lens
19	7529415E02	MIC grommet

* Not illustrated.

Figure 11 GSM 6700 Mechanical Explosion Illustration



Glossary

Those marked ** are Motorola specific abbreviations.

A

A Interface	Interface between MSC and BSS
A3	Authentication algorithm
A5	Stream cipher algorithm
A8	Ciphering key generating algorithm
AB	Access Burst
A-bis	Interface between BSC and BTS
ACCH	Associated Control CHannel
ACSE	Association Control Service Element
AGCH	Access Grant CHannel
AOC	Advice of charge
ARFCN	Absolute Radio Frequency Channel Number
ARQ	Automatic Request for retransmission
ASIC	Application Specific Integrated Circuit
AUC	Authentication Center
AUT(H)	Authentication

B

BA	BCCH Allocation
BAIC	Barring of All Incoming Calls
BAOC	Barring of all Outgoing Calls
BCC	Base Transceiver Station (BTS) Color Code
BCCH	Broadcast Control CHannel
BCD	Binary Coded Decimal
BCU	BTS Control Unit **
Bm	Full-rate traffic channel
BN	Bit Number
BS	Base Station
BSC	Base Station Controller
BSIC	Base Transceiver Station Identity Code
BSS	Base Station System
BSSAP	BSS Application Part (DTAP and BSSMAP)
BSSC	Base Station System Control Cabinet **
BSSMAP	Base Station Systems Management Application Part
BSSOMAP	BSS Operation and Maintenance Application Part
BSU	Base Site Controller Unit **

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BTS Base Transceiver Station

C

CA Call Allocation

CBCH Call Broadcast CHannel

cc Call Control

cc Country Code

CCBS Completion of Calls to Busy Subscribers

CCH Control CHannel

CCCH Common Control CHannel

CFS Call Forwarding on mobile Subscriber busy

CFU Call Forwarding Unconditional

CLIP Calling Line Identification Presentation

CLIR Calling Line Identification Restriction

CM Connection Management

COLP Connected Line identification Presentation

COLR Connected Line identification Restriction

CONF Conference Call add on

CSPDN Circuit Switched Public Data Network

CUG Closed User Group

CW Call Waiting

D

DB Dummy Burst

DBS Distributed Base Station **

DCCH Dedicated Control CHannel

DET Detach

DFE Decision Feedback Equalizer

DISC DISConnect

DL Data Link (layer)

Dm Control Channel (ISDN terminology applied to mobile service)

Dm Signalling channel

Dp Dialled Pulse

DRCU Diversity Radio Channel Unit**

DRX Discontinuous Reception

DTAP Direct Transfer Application Part

DTE Data Terminal Equipment

DTMF Dual Tone Multi-Frequency (tone signalling type)

DTX Discontinuous Transmission

E

E erlang

Eb/No Energy per Bit/Noise floor

EC Echo Canceller

Ec/No Ratio of energy per modulating bit to the noise spectral density

EIR Equipment Identity Register

EIRP Effective Isotropic Radiated Power

EMC Electromagnetic Compatibility

EMX Electronic Mobile Exchange **

ETSI European Telecommunications Standards Institute

F

FACCH Fast Associated Control CHannel

FACCH/F Full rate Fast Associated Control CHannel

FACCH/H Half rate Fast Associated Control CHannel

FB Frequency correction Burst

FCCH Frequency Correction CHannel

FEC Forward Error Correction

FN Frame Number

FTAM File Transfer Access Management

G

GMSC Gateway Mobile Services Switching Center

GMSK Gaussian Minimum Shift Keying

GSM Group Special Mobile

GSM MS GSM Mobile Station

GSM PLMN GSM Public Land Mobile Network

H

HANDO Handover

HDLC High Level Data Link Control

HLR Home Location Register

HOLD Call Hold (Supplementary Service)

HPLMN Home PLMN

HPU Hand Portable Unit

HSN Hopping Sequence Number

I

I Information (frames)

IA5 International Alphanumeric 5

ID IDentification

IMEI International Mobile Equipment Identity

IMM IMMediate assignment message

IMSI International Mobile Subscriber Identity

IN Intelligent Network

ISC International Switching Center

ISDN Integrated Services Digital Network

ISUP ISDN User Part

IWF Interworking Function

J

K

Kc ciphering Key

Ki Individual subscriber authentication key

L

LAC Location Area Code

LAI Location Area Identification (Identity)

LAPB Link Access Procedure 'B' (balanced) channel

LAPDm Link Access Procedure 'DM' (mobile 'D') channel

Lm Traffic channel (with capacity lower than Bm)

LPC Linear Predictive Code

LR Location Register

M

MA Mobile Allocation

MAH Mobile Access Hunting

MAI Mobile Allocation Index

MAIO Mobile Allocation Index Offset

MAP Mobile Application Part

MCC Mobile Country Code

MCI Malicious Call Identification

MD Mediation Device

ME Mobile Equipment

MF Multi-Frequency (tone signalling type)

MLSE Maximum Likelihood Sequence Estimator

MM Mobility Management

MMI Man Machine Interface

MNC Mobile Network Code

MO Mobile Originated

MO/PP Mobile Originated Point to Point messages

MoU Memorandum of Understanding

MRN Mobile Roaming Number

MS Mobile Station

MSC Mobile Services Switching Center

MSCM Mobile Station Class Mark

MSIN Mobile Station Identification Number

MSISDN Mobile Station international ISDN number

MSRN Mobile Station Roaming Number

MT Mobile Termination

MTP Message Transfer Part

MT/PP Mobile Terminated Point to Point messages

N

NB Normal Burst

NE Network Elements

NET Norme European de Telecommunications

NM Network Management

NHC Network Management Center

O

O&M Operations and Maintenance

OACSU Off Air Call Set-Up

OCB Outgoing Calls Barred

OMAP Operations and Maintenance Application Part (previously was OAMP)

OMC Operations and Maintenance Center

OMCR Operations and Maintenance Center -Radio Part

OMCS Operations and Maintenance Center -Switch Part

OSI Open System Interconnection

P

PAD Packet Assembly Disassembly facility

PCH Paging CHannel

PDN Public Data Networks

PIN Personal Identification Number

PLMN Public Land Mobile Network

POTS Plain Old Telephone Service (basic telephone services)

PSPDN Public Switched Packet Data Network

PSTN Public Switched Telephone

PTO Public Telecommunications Operator

Q

QOS Quality of Service

R

RAB Random Access Burst

RACH Random Access CHannel

RBDS Remote BSS Diagnostic Subsystem **

RBU Remote Base Station Unit (PCN) **

RCU Radio Channel Unit **

REC RECommendation

REL RELease

RELP-LTP Regular Pulse Excitation - Long Term Prediction

REQ REQuest

RFCH Radio Frequency CHannel

RFN Reduced TDMA Frame Number

RLP Radio Link Protocol

ROSE Remote Operations Service Element (a CCITT specification for O&M)

RXCDR Remote Transcoder Unit **

RXLEV Received signal level

RXQUAL Received signal quality

S

SABM Set Asynchronous Balance Model

SACCH Slow Associated Control CHannel

SAPI Service Access Point Indicator (Identifier)

SB Synchronization Burst

SC Service Center

SCCP Signalling Connection Control Part

SCH Synchronization CHannel

SCP Service Control Point - an intelligent network entity

SDCCH Stand-alone Dedicated Control CHannel

SDL Specification Description Language

SFH Slow Frequency Hopping

SIM Subscriber Identity Module

SMS Short Message Service

SMSCB Short Message Service Call Broadcast

SND SeND

SP Signalling Point

SRES Signed RESponse (authentication)

SS Supplementary Service

SS System Simulator

STP Signalling Transfer Point

SYSGEN SYStem GENeration

T

TA Terminal Adaptor

TA Timing Advance

TCAP Transaction Capabilities Application Part

TCH Traffic CHannel

TCH/F A full rate TCH

TCH/FS A full rate speech TCH

TCH/HS A half rate speech TCH

TCP Transmission Control Protocol

TDMA Time Division Multiple Access

TE Terminal Equipment

TMN Telecommunications Management Network

TMSI Temporary Mobile Subscriber Identity

TN Timeslot Number

TRX Transceivers

TTY TeleTYpe (refers to any terminal)

TS Time Slot

TUP Telephone Users Part

U

UI Unnumbered Information frame

Um Air Interface

V

VAD Voice Activity Detection

VLR Visited Location Register

VLSI Very Large Scale Integration (IC)

VPLMN Visited PLMN

W

X

XC Transcoder

XCDR Transcoder **

Y

Z

3PTY Three ParTY service

MOTOROLA
Cellular Subscriber Group

SERVICE MANUAL FEEDBACK FORM

Service Manual Feedback Form

To report any problems or omissions to this service manual:

1. Photocopy this page.
2. Fill out the boxes below and give your comments.
   (This comment page can be used for any Motorola Cellular Subscriber service manual)
3. Fax this form to Motorola Asia Pacific Cellular Subscriber Division
   Fax number (847) 523-8795, Attn: Mr. Reginald Townsend

Service Manual Number: _____ **Revision:**_____

Your Name:_____

Address: _____

Telephone Number: _____

Nature of Problem or Omission: _____
(Specify Section, Page Number, Diagram, etc.)

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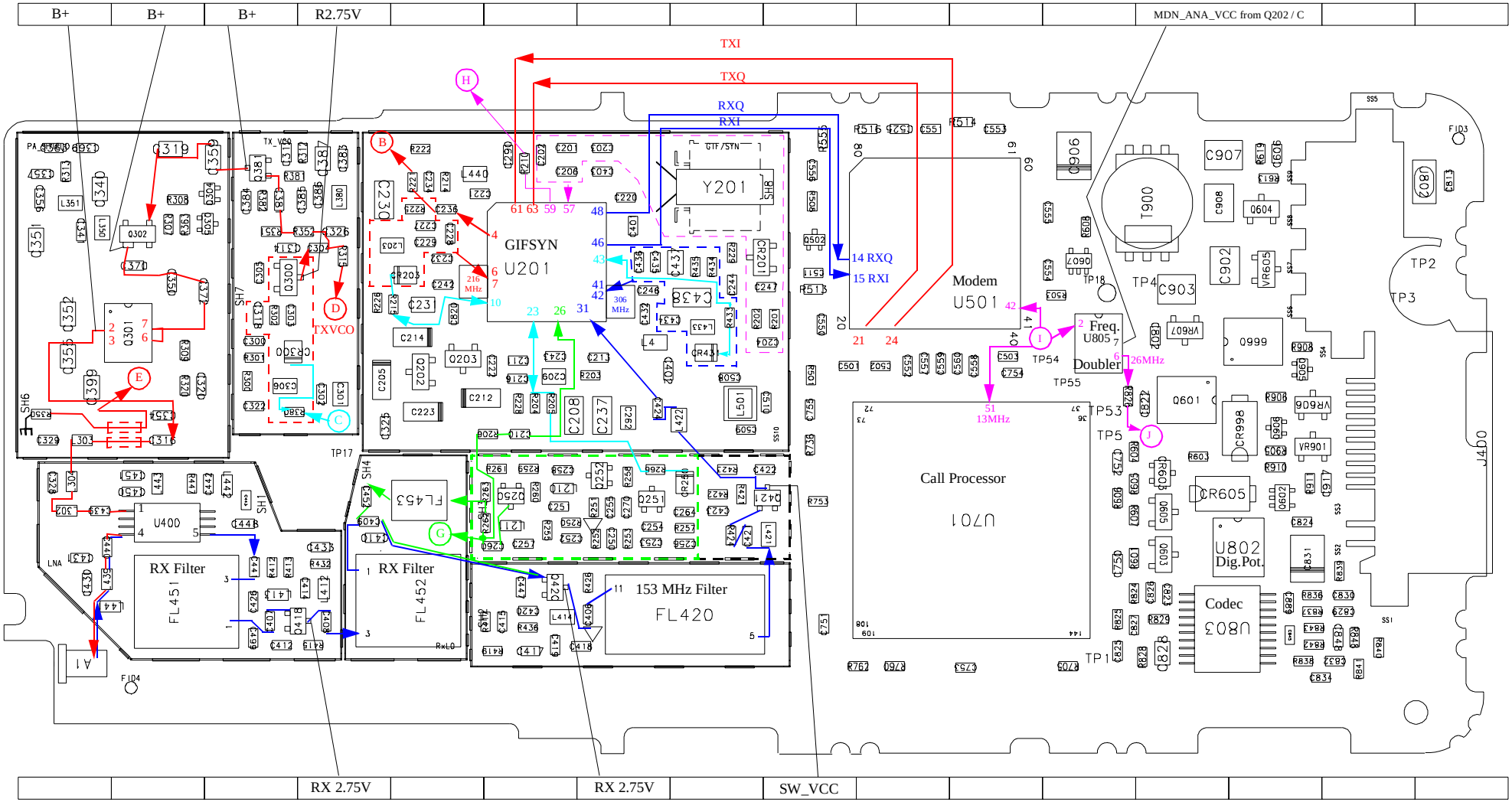


J400

1 GND	6 GND
2 EXT_B+	7 PWR_SW
3 DSC_EN_B	8 AUDIO_IN
4 DOWNLINK	9 MAN_TEST
5 UPLINK	10 BATT_FDBK

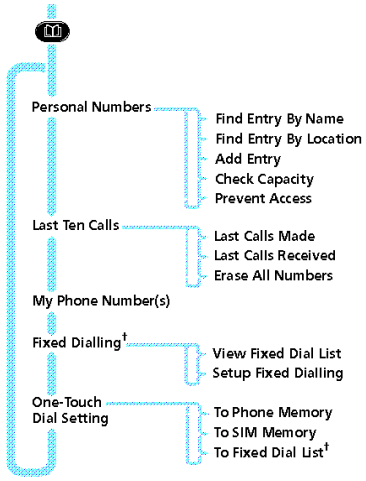
RX SIGNAL	
TX SIGNAL	
MAIN VCO	
TUNING VOLTAGES	
REF. CLOCK	

B	Tx modulated 108 MHz	G	Main VCO signal 794.4 MHz
C	TX VCO tuning voltage	H	13 MHz clock
D	TX VCO feedback 902.4 MHz	I	13 MHz clock
E	TX PA feedback 902.4 MHz	J	26 MHz clock

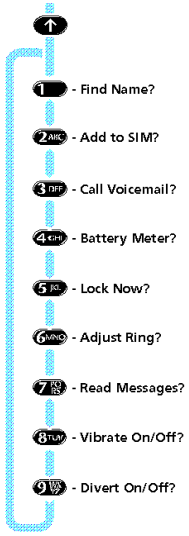
8409414R13_C_V1
GSM 8700 TRANSCEIVER
SCALE 4:1 DATE 15-OCT-96

High Tech. Centre - Flensburg European Cellular Subscriber Division	March 5th 1997
DRAWINGS	Rev. 1.0
6700 / 8700 - SIGNAL WAYS	
Author : Michael Hansen / Technical Support	Page 2 of 3

Phone Book Menu



Quick Access Menu ‡


1 - Find Name?
2 - Add to SIM?
3 - Call Voicemail?
4 - Battery Meter?
5 - Lock Now?
6 - Adjust Ring?
7 - Read Messages?
8 - Vibrate On/Off?
9 - Divert On/Off?

Menu Navigation

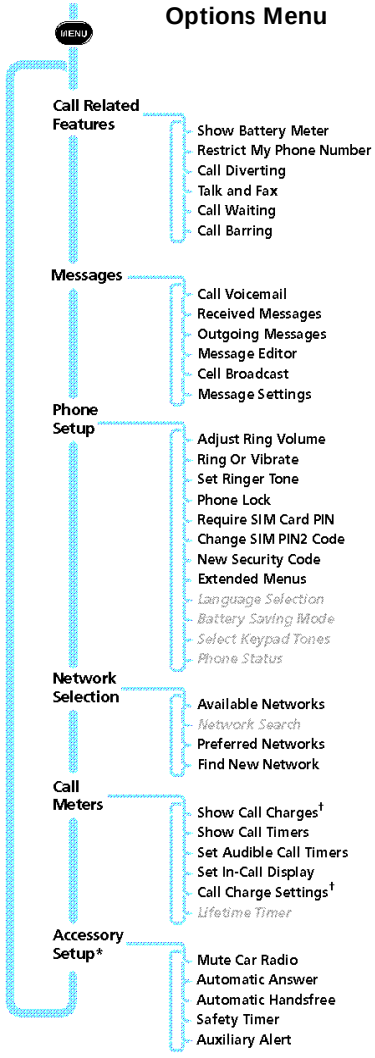
Items shown in *italics* are available only when **Extended Menus** are switched on.

† Availability depends on the type of SIM card.

* The **Accessory Setup** option is available only when a car kit is fitted.

‡ The features and the positions of the features in the Quick Access menu can be changed.

Options Menu



Quick Reference

English

Quick Reference

English

Special Keys

S	Press to turn phone on and off.
I	Press to see more information on the operation currently displayed.
O	Press to accept call, setting, option,...
Q	Press to access the Phone Book menu.
E	Press to access the Quick Access features.
M	Press to access the Options menu.
C	Press to reject call, setting, option,...

Making a Call

Enter **Phone No.** O .

Receiving a Call

Press O or open the flip.

Ending a Call

Press O or close the flip.

Making an Emergency Call

Enter 1 1 2 O . The call will be directed to a central emergency operator.

Muting the Phone

When in a call, press the mute button on the left hand side of the phone.

Redialling the Last Number Called

1 Press O to display the last number dialled.

2 Press O to call the number.

One-Touch Dialling

Press and hold the appropriate digit key 1 to 9 .

Storing Numbers in the Phone Book

1 Press and hold Q to access the Phone Book.

2 Press O to select phone memory, or
M O to select SIM card memory.

3 Enter **Phone No.**, then **Name**, then **Location**.

Dialling Phone Book Numbers

Enter **Location** # O

Quick Access Features

Press E followed by the appropriate key, or press E , scroll to the feature and press O to select.

Introduction

Congratulations on your purchase of a cellular telephone from *Motorola*, the world leader in cellular technology.

All *Motorola* cellular telephones are manufactured to exacting specifications and world-class quality standards, and are designed to withstand the harshest environmental conditions. Our commitment to Total Customer Satisfaction and over sixty five years of experience in personal communications mean you can depend upon the quality of this *Motorola* product.

This cellular telephone incorporates *Personality*™. Unique to *Motorola*, *Personality*™ removes the complexity of cellular communications by guiding you through the features and presenting you with simple choices every step of the way. *Personality*™ also allows you to personalise the way you use your phone - for example, different ringer tones, a phone book and network selection preferences - all presented with clarity and simplicity. In this manual, each of the *Personality*™ features is identified with an O symbol to indicate that it is customisable to meet your requirements.

This cellular telephone has been designed for use with the worldwide GSM (Global System for Mobile communications) network. By using digital communications methods, your phone provides a number of advantages over traditional cellular systems:

- Superior speech quality is attained without the usual background noises and interference.
- Your conversation may be encrypted for security. Conversations cannot be eavesdropped using scanning equipment when the signal is encrypted.
- You are not restricted to use within one country.

Your subscriber number is not contained within the phone as with other systems. Instead, a 'Smart Card' known as a SIM (Subscriber Identity Module) is supplied by your Cellular Service Provider. All call billing is made to the subscriber number on the card whether it is used in this or any other GSM unit.

! *Before you use your phone, please see the 'Your Battery' section for important information on charging a new battery.*

Understanding this Manual

Many of your phone options are accessed by a simple menu system. A full description of the menus and how to move around them is covered in the later section ***Menu Navigation***. When the manual describes the use of each menu item, it will be assumed that you are familiar with the menu system.

Key Presses

Key presses are represented in this manual using symbols so that you may locate and use the required sequence quickly. A sequence of key presses may be shown as follows:

M O C

This means that you should press the M key followed by the O key and then the C key, in sequence, not simultaneously.

Entering Information

When you are requested to enter information, such as the number of the phone you wish to call, this is represented in **bold** type. For example:

Phone No. - enter the required telephone number.

PIN Code - enter your Personal Identification Number.

Unlock Code - enter your unlock code.

Location - enter the Phone Book location number.

Prompts and Messages

Your phone responds to key presses by displaying either easy to understand prompts that guide you to the next action, or simple messages confirming that your action is complete. Prompts and messages are represented in this manual in LCD style, for example:

`Enter PIN` or `Completed`.

Other Symbols

You will find the following symbols used throughout this manual:

A A Note contains additional information which is relevant to the feature/item.

! A Caution contains important additional information which is relevant to the efficient and/or safe usage of your phone.

O This symbol indicates that the feature is a *Personality*™ feature that can be customised to meet your requirements.

L This symbol indicates a short key sequence for the feature.

Contents

Safety

Important information for the efficient and safe operation of your phone 5

About Your Phone, Battery and SIM Card

Introduces your phone, explains how to charge and maintain batteries and explains about your SIM Card 9

Making and Receiving Phone Calls

Explains how to call a number, how to redial and how to accept a call..... 17

Menu Navigation

Explains how to access and use the phone's menus 23

Using The Phone Book Menu

Provides an explanation of the Phone Book Menu and how to use it 27

Using The Options Menu

Provides an explanation of the Options Menu and how to use it 35

Using the Quick Access Menu

Provides an explanation of the Quick Access Menu and how to use it..... 61

Accessories

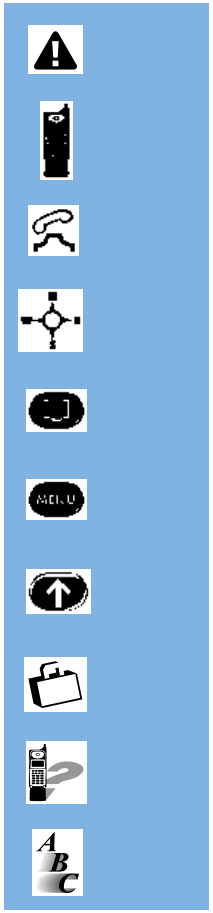
Details the accessories available for use with your phone..... 65

What To Do If...

Helps you to solve any problems that may occur..... 67

Index

A comprehensive index 69



The Manufacturer reserves the right to make changes in technical and product specifications without prior notice.

Safety

IMPORTANT

For the efficient and safe operation of your GSM Cellular Telephone,

Read this information before use.

Your GSM cellular telephone is one of the most exciting and innovative electronic products ever developed. With it you can stay in contact with your office, your home, emergency services, and others, wherever service is provided.

General

Your cellular telephone utilizes the GSM standard for cellular technology. GSM is a newer radio frequency ("RF") technology than the current FM technology that has been used for radio communications for decades. The GSM standard has been established for use in the European Community and elsewhere.

Your cellular telephone is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your cellular telephone, the cellular system handling your call controls both the radio frequency and the power level of your cellular telephone.

Exposure To RF Energy

There has been some public concern about possible health effects of using cellular telephones. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product is fit for use.

If you are concerned about exposure to RF energy there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular telephone efficiently by following the below guidelines.

Efficient Phone Operation

For your phone to operate at the lowest power level, consistent with satisfactory call quality:

If your phone has an extendable antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However, your phone operates more efficiently with the antenna fully extended.

Hold the phone as you would any other telephone. While speaking directly into the mouthpiece, position the antenna up and over your shoulder.

Do not hold the antenna when the phone is "IN USE". Holding the antenna affects call quality and may cause the phone to operate at a higher power level than needed.

Antenna Care and Replacement

Do not use the phone with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.

Use only the supplied or approved antenna. Unauthorised antennas, modifications or attachments could damage the phone and may contravene local RF emission regulations or invalidate type approval.

Driving

Check the laws and regulations on the use of cellular telephones in the areas where you drive. Always obey them. Also, when using your phone while driving, please:

- give full attention to driving,
- use hands-free operation, if available, and
- pull off the road and park before making or answering a call if driving conditions so require.

Electronic Devices

Most electronic equipment, for example in hospitals and motor vehicles, is shielded from RF energy. However, RF energy may affect some malfunctioning or improperly shielded electronic equipment.

Vehicle Electronic Equipment

Check with your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

Medical Electronic Equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.

Turn your phone **OFF** in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

Aircraft

Turn your phone **OFF** before boarding any aircraft.

- Use it on the ground only with crew permission.
- Do not use in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your phone while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your phone whilst airborne.

Children

Do not allow children to play with your phone. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the phone, or make calls that increase your telephone bills.

Blasting Areas

To avoid interfering with blasting operations, turn your unit **OFF** when in a "blasting area" or in areas posted: "turn off two-way radio". Construction crews often use remote control RF devices to set off explosives.

Potentially Explosive Atmospheres

Turn your phone **OFF** when in any area with a potentially explosive atmosphere. It is rare, but your phone or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations; below decks on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your phone or accessories.

Before using your phone in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

Safety Standards

This Cellular Telephone complies with all applicable RF safety standards.

This cellular telephone meets the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by governmental bodies and other qualified organisations, such as the following:

- **Verband Deutscher Elektroingenieure (VDE) DIN-0848**
- **Directives of the European Community, Directorate General V in Matters of Radio Frequency Electromagnetic Energy**
- **National Radiological Protection Board of the United Kingdom. GS-11, 1988.**
- **American National Standards Institute (ANSI)/IEEE. C95. 1-1992**
- **National Council on Radiation Protection and Measurements (NCRP). Report 86**
- **Department of Health and Welfare Canada, Safety Code 6.**

Battery Safety

- To prevent injury or burns, do not allow metal objects to contact or short circuit the battery terminals.
- Make sure that the battery terminals do not touch greasy objects.
- Do not immerse the battery in water, or dispose of in a fire.
- Ensure that the battery is disposed of using the proper facilities.
- If you need to replace the battery, make sure that you use only the approved battery type.
- The use of other types of batteries might affect your phone and in such cases the manufacturer assumes no liability.

European Union Directives Conformance Statement

This product is in conformance with the requirements of the applicable EU Council Directives.

Declarations of Conformance with the requirements are located at:

Motorola Ltd.
European Cellular Subscriber Division
Midpoint, Alençon Link
Basingstoke, Hampshire RG21 7PL
United Kingdom

About Your Phone, Battery and SIM Card

Special Keys

S	Turns the phone on and off.
I	Press to see more information on the operation currently displayed.
O	Accept call, setting, option.
Q	Access the Phone Book menu.
E	Access the Quick Access menu.
M	Access the Options menu.
C	Reject call, setting, option.
< #	Move backward and forward through the entries.

The Flip

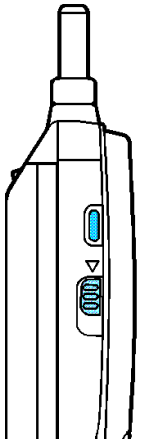
Opening the flip answers a call; closing the flip ends a call.

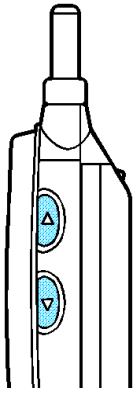
The Mute Button

The Mute button is on the left hand side of your phone. Press to switch privacy mute on and off during a call.

SIM Card Release

The SIM card release button is on the left hand side of your phone. To remove the SIM card, slide this button down toward the base of the phone and pull the SIM card out.

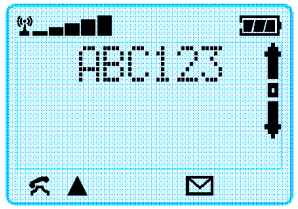




Volume Buttons

The buttons on the right hand side of your phone adjust the earpiece, keypad tone and ringer volume levels. Volume is increased with the upper button and decreased with the lower button.

The Display



The display on your phone can display alphanumeric characters as well as useful information symbols.

The various elements of the display are as follows:

ABC123	Characters are used to display messages and telephone numbers.
	Battery Charge Indicator. The more segments displayed, the greater the battery charge.
r x	**Signal Strength**. The more segments displayed in the bar graph, the better the signal strength.
k	**In Use**. Displayed when a call is in progress.
l	**Roam.** Displayed when you are registered on a system other than your home system.
o	**Short Message Service**. Displayed when the phone has received a message. The symbol will flash when your message storage area is full.
B ... K	Icons are displayed when you are in the Quick Access menu.
S	A scroll bar will appear on the right of the display when you are in a list/menu. The button on the scroll bar indicates where you are in the list.
z	Indicates that a menu item is currently selected.

In addition, when you are expected to press the O key, a prompt will appear in the display, for example Entry Complete?.

Low Temperature Use

The liquid crystal display used in your phone will behave differently at extremely low temperatures. You may notice that the display responds slowly to key presses; this is to be expected and does not affect the phone operation in any way.

Low Battery Warning

When the battery level is low and only a few minutes of talk time remain, a warning signal (two double beeps) will sound, the border of the battery symbol will begin to flash, and Low Battery will be displayed.

When the battery is completely discharged, your phone will turn off.

Looking After Your Phone

- Never leave your phone or battery in extreme temperatures (over 60°C), for example behind glass in very hot, direct sunlight.
- To clean your phone, use a moistened or antistatic cloth. Do **not** use a dry or electrostatically charged cloth.

Your Battery

Charging a New Battery

To ensure maximum battery performance, it is recommended that a new battery (or battery that has not been used for several months) be charged for at least 14 hours before use.

A *A new battery will require several full charge/discharge cycles in order to achieve its optimum performance.*

A *A new battery, or a battery that has not been used for several months, may cause a premature fully charged indication on the charger. Ignore this indication and let the battery charge for several more hours, remove and re-insert the battery into the charger, and charge for an additional 14 hours.*

Important Battery Information

To ensure that you enjoy maximum battery life and use your battery to it's fullest capacity:

- Always use *Motorola* approved battery chargers.
- For the best results, Li-Ion batteries should be charged using the E•P Desktop Charger.
- The battery should be at or near room temperature when charging.
- Once a week, allow your battery to discharge completely before recharging (to fully discharge, leave your phone on until it turns itself off).

! *Do not leave the battery connected to any charger (except the E•P Desktop Charger) for longer than 24 hours.*

Battery Performance and Maintenance

- Best battery performance will be achieved when you regularly charge and discharge batteries as instructed in this manual.
- Battery performance is greatly affected by the coverage of the GSM network.
- Set `Battery Saving Mode` to On (see 'Phone Setup Menu') and/or `Frequency of Search` to Slow or Medium (see 'Network Selection Menu').
- Keep the antenna fully extended whenever possible to ensure maximum signal strength.
- The performance of your batteries will gradually reduce if used substantially.
- If left unused, a fully charged battery will discharge itself in approximately one month.
- When not in use, store your battery uncharged in a cool, dark and dry place.

Desktop Charging of Your Battery

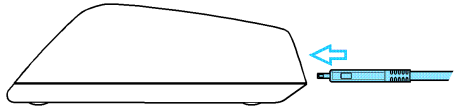
Typical charge times for achieving a 90% charge level using the E•P Desktop Charger are:

Battery Type	Charge Time
Slim 600 mAh NiMH	1.5 hours
Slim 400 mAh Li-Ion	4 hours
Extra Capacity 1300 mAh NiMH	1.5 hours
Extra Capacity 1200 mAh Li-Ion	4 hours

- *The battery will continue to slow charge until fully charged.*
- *For maximum NiMH battery charging, you should double the charge time.*

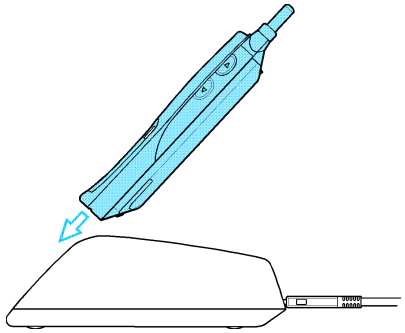
Desktop Charger Power Supply

The E•P Desktop Charger uses the travel charger as its wall adapter. The travel charger can be plugged into a standard mains socket and the lead then plugged into the socket at the rear of the desktop charger.



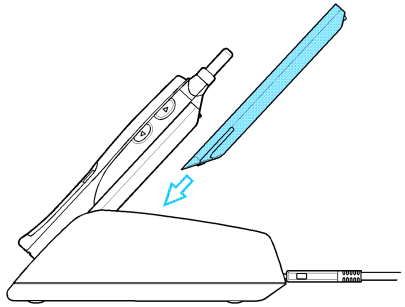
Inserting Your Phone into the Charger

Tilt your phone back until it rests at the same angle as the cut away front panel of the charger. Next, guide your phone into place in the front slot, until the lower indicator lights up.



Inserting a Spare Battery into the Charger

If you wish to insert a spare battery at the same time as charging your phone, slide the battery into the rear slot, at the angle shown, until the upper indicator lights up.



- *It is normal for batteries to become warm during charging.*

Charger Indicators

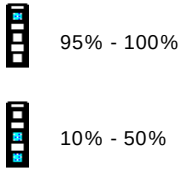
The E•P Desktop Charger has two sets of indicators at the front to provide charging status information. The lower indicators represent the front slot, while the upper indicators show charge status for the rear slot.

When both slots are being used, the front slot will always charge first.

Each indicator consists of three coloured LEDs:

Green
Yellow
Red

As explained on the bottom of your E•P Desktop Charger, the approximate charge level is indicated as follows:



95% - 100%

90% - 95%

50% - 90%

10% - 50%

0-10%

A rapid flashing of a red indicator shows a faulty battery that will not charge.

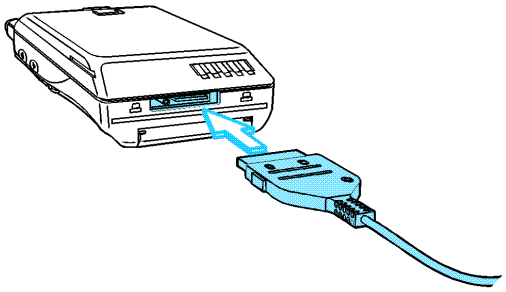
A rapid flashing of a yellow indicator shows the battery is out of rapid charge range. Rapid charge will automatically begin or continue when the battery is in range.

A slow flashing of the upper indicators shows that the front slot has priority. Charging will not begin until the front slot is fully charged.

Charging Your Battery

To charge your phone, connect your travel charger directly to your phone.

! *If you are travelling, you must ensure that the mains voltage of the country to which you are travelling matches your travel charger ratings.*



1 Fit the battery to your phone.

2 Switch off your phone.

3 Connect the travel charger to the base of your phone (see diagram). This begins charging the battery. While the travel charger is connected to your phone, the battery symbol will flash.

When the battery is about 90% charged, the message `Charging Complete` will be displayed.

A *If the display is completely blank when the travel charger is connected, the battery is not being charged.*

Typical charge times for achieving a 90% charge level using the travel charger are:

Battery Type	Charge Time
Slim 600 mAh NiMH	1.5 hours
Slim 400 mAh Li-Ion	4 hours
Extra Capacity 1300 mAh NiMH	2.5 hours
Extra Capacity 1200 mAh Li-Ion	4 hours

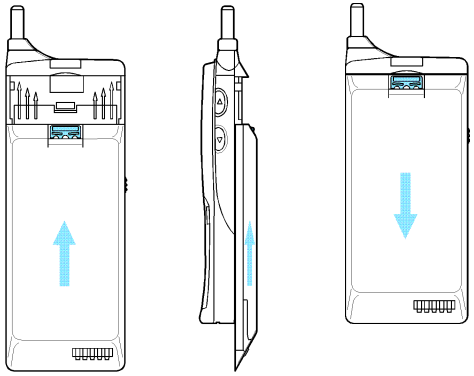
! *The battery will continue to slow charge until fully charged. Do not leave the battery connected to the travel charger for more than 24 hours.*

A *For maximum NiMH battery charging, you should double the charge time.*

A *Charge times will increase if you make or receive phone calls while charging.*

Fitting Your Battery

Place the battery onto the rear of the phone just below the marked arrow indicators. Next, slide the battery upwards on the phone's moulded runners, until it locks into place.



Removing Your Battery

! *Switch off your phone before removing the battery. Failure to do so may damage your phone memory.*

Press the release catch inwards and simultaneously slide the battery downwards, until it reaches the end of it's travel. Next, pull the battery away from the rear of the phone.

Your SIM Card

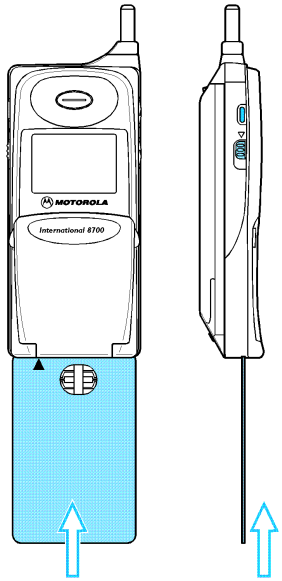
Your credit card sized SIM (Subscriber Identity Module) card was supplied by your Cellular Service Provider when you bought your phone. You will not be able to make or receive calls if you do not have a SIM card inserted in your phone.

A *Some networks allow you to make emergency calls without a SIM card inserted.*

The SIM card is a 'Smart Card' that contains your phone number, service details and memory for storing Phone Book numbers and messages. You can therefore use your SIM card in someone else's GSM phone and you will be charged for the call.

Like a bank or credit card, you should keep your SIM card secure. Do not bend or scratch your card and avoid exposure to static electricity or water.

! *Switch off your phone before inserting or removing the SIM card. Failure to do so may damage the memory on your SIM card.*



SIM Card Insertion

Switch off your phone by pressing the S key and insert the SIM card into the slot in the base of the phone, as shown. If the SIM card is inserted the wrong way round, or damaged, the `Check Card` message may be displayed. Remove the SIM card, check that it is the right way round and then re-insert it into the phone.

If either of the `Bad Card See Supplier` or `Blocked See Supplier` messages are displayed, then you will need to contact your Cellular Service Provider.

SIM Card Removal

Switch off your phone and push the release button towards the base of the phone. Pull the SIM card out.

Making and Receiving Phone Calls

Switching the Phone On and Off

To switch the phone on or off press and hold the S key. If VibraCall is selected, the phone will vibrate when it is switched on.

If you switch the phone on and there is no SIM card inserted, you will be asked to insert one. Once inserted, the phone will check that the SIM card is valid.

A number of messages will then be displayed:

- `Enter PIN` - a request to enter the SIM card PIN code (if required).
- `Enter Phone Unlock Code` - a request to enter the phone unlock code (if required).
- `Searching...` followed by a network name - as the phone searches and then finds a suitable network to connect to.

Entering Your SIM Card PIN Code

To enter the PIN code, enter **PIN Code** O .

As you type in each digit of the PIN code a * character will be displayed.

If you make a mistake, press and release the C key to remove the last digit. Holding the C key down will remove the entire entry.

When the PIN code is complete press the O key.

If the PIN code entered is incorrect, the warning message `Wrong PIN` will be displayed, followed by `Enter PIN`.

! *If the PIN number is entered incorrectly three times in a row, your phone will automatically lock-up and the* `Blocked` *message will be displayed. See 'Unblocking Your Phone' for details on unblocking your phone.*

The PIN code can be changed, see 'Change SIM PIN Code' in the ***Using the Options Menu*** section for more details.

O Entering Your Unlock Code

If your phone displays the message `Enter Phone Unlock Code` you must enter your unlocking code by entering **Unlock Code** O .

The unlock code is a four digit number which is set at manufacture to **1234**. The code can be changed, see 'Change Unlock Code' in the ***Using the Options Menu*** section for more details.

If you forget your unlock code, press the M key. This will display the 'Change Unlock Code' option. Enter O **Security Code**, enter a new unlock code, and press O .

Making a Phone Call

To make a phone call, your phone must be switched on, unlocked and have the antenna fully extended.

It will not be possible to make a phone call unless you are in an area where there is a GSM service. When a service has been found, a series of rising bars, x , will show the signal strength.

There are a number of different ways to make a phone call:

- Using the digit keys.
- Using automatic redial.
- Redialling the last number called.
- One-touch dialling a Phone Book entry*.
- Dialling a Phone Book entry*.
- Calling an embedded number in a message.

A **Your phone contains a 'phone book' that can be used to store names and telephone numbers. See* ***Using The Phone Book Menu*** *for further details.*

The simplest method of making a phone call is to enter the number using the digit keys then press O .

A *If you make a mistake, press and release the C key to remove the last digit. Holding the C key down will remove the entire number.*

Your phone will then attempt to make the phone call. The display will show `Calling` to show the call attempt is being made. If the call is not answered, pressing O , or closing the flip, at this point will end the attempt.

When the phone call is answered, the display will change to `Connected` for a few seconds, followed by `End Call?`.

To end your call press O , or close the flip.

Automatic Redial

If your call attempt does not succeed, the message `Redial?` will be displayed for five seconds. Pressing O at this point will automatically redial the phone number.

When the call is answered, you will hear a short ring tone.

The maximum number of redial attempts is set by your Cellular Service Provider. If the phone call cannot be connected within this maximum, the message `Redial Failed` will be shown.

Redialling the Last Number Called

L *When in standby mode, press* O O .

Alternatively, you can retrieve the last number dialled using the 'Last Ten Calls' feature in the Phone Book menu.

O One-Touch Dialling Phone Book Numbers

To quickly retrieve and dial a number stored in the first nine locations of your Phone Book[1], press and hold the appropriate digit key. For example, pressing and holding 2 will dial the phone number stored in location 2 of your Phone Book.

A *You do not need to press* O *to call the number.*

O Dialling Phone Book Numbers

L **Location** # O

Alternatively you can:

1 Press Q **Location**. For example Q 2 3 will retrieve the phone number stored in location 23 of your Phone Book.

If you don't know the exact location, you can enter a random location and then use the < *and* > *keys to scroll to the number you want.*

2 Press O to call the number.

Calling an Embedded Number in a Message

Details on how to call a number embedded in a message are given in the ***Messages Menu*** section.

International Phone Calls

To make an international phone call press and hold the 0 key. After a couple of seconds the international dialling prefix + will appear in the display, this allows you to call from any country without knowing the local international access code.

Now enter the country code, followed by the phone number. The country code follows the conventional format, 49 for Germany, 44 for the UK, 46 for Sweden, etc.

Just like a conventional international call, remove the leading '0' of the area code when you dial.

Inserting Pauses Into Phone Numbers

To obtain a three second 'pause' character in a phone number, press and hold the * key for a couple of seconds, the pause symbol Ü will appear.

The pause character produces a three second delay whenever it is used. However, the first pause character in a phone number is a special case, it will not begin its delay until the call is answered.

1. *The Phone Book entries that you are able to access will depend on the One-Touch Dial Setting option in the Phone Book menu.*

Pause - A Working Example.

If, for example, you have a tone-based voicemail system on 555-6911, with a mailbox number 1066 and password 2001. Then you may dial the following number:

`5556911Ü1066Ü2001` O .

The first part of the number would be used to call the voicemail system.

When the call is answered the first pause will produce a delay of three seconds before the tones for `1066` are sent to select the mailbox.

There will be a second pause of three seconds before the tones for `2001` are sent as the password.

GSM Emergency Calls

The worldwide GSM network provides a standard number, 112, to dial in cases of emergency.

Provided that your phone has found a network, you will be able to make an emergency call. The call can be made regardless of any security codes and, depending on the network, with or without a SIM card inserted.

The emergency call will be directed to a central emergency operator.

To dial the GSM emergency number, press

1 1 2 O .

While the emergency call is being made and connected, the display will show `Emergency Calling`.

Receiving a Phone Call

To receive a phone call:

- Your phone must be switched on and unlocked.
- You must be in an area where there is GSM service.
- Your Call Diversion and Call Barring settings should not be set to divert or bar incoming calls.

When your phone receives a call, it will ring or vibrate and the display will show the `Call` message (if you have Caller Line Identification, the caller's number or name will be displayed instead).

To answer the call, press O or open the flip. If the signal strength is weak then extend your antenna.

If you do not wish to answer a call you can either:

Press and release the C key. If you have enabled the 'Detailed Diverting - If Busy' option in the Options Menu, the caller will be diverted to the forwarding number, otherwise the caller will hear the busy tone.

or

Press and hold the C key. This will reject the incoming call. No call divert option will be offered.

If your phone rings and you do not answer it, the message `Unanswered Call` will be displayed to show you that a call attempt was received.

Ending a Phone Call

To end a phone call, press O or close the flip.

Menu Navigation

A large number of your phone's options are accessed by using menus which use a common approach for selection, change and cancellation.

Please read this section carefully before attempting to access a menu option. When you understand the common approach to menu navigation and how the menus are shown on the page, you will be able to access and change options with ease.

The menus described here can only be accessed when the phone is in the standby mode. Menu operation is not possible when you are making or answering a phone call.

Entering the Menus

Three different keys are used to access each of the three menus:

Q	accesses the Phone Book menu
M	accesses the Options menu
E	accesses the Quick Access menu

Once entered, the menus use the M , < , > , O and C keys in a common manner to access and change individual options.

Leaving the Menus

To leave any of the menus, you can either press and hold the C key or repeatedly press the C key. Both of these actions will return your phone to the standby mode.

A *Alternatively, a quicker way to leave the menus is to press* E C .

Menus and Sub-menus

A menu is a simple list of options. Some of these options provide access to a further list of options called a sub-menu. When navigating through the menus you may find it is helpful to think in terms of menu levels - the 'parent' menu being on one level and its sub-menus being on a lower level.

Moving to and Selecting a Menu Option

To move from one option to another on the same level, use the scroll keys: the M and > keys scroll forwards and the < key scrolls backwards. When you find the option you want, press the O key to select it.

Depending on the option you select, one of three things will happen:

- either a brief message will be displayed confirming an action, for example `Completed`.
- or a prompt will be displayed requesting you to enter information, for example `Enter PIN` or `Enter Name`.
- or the first option of a sub-menu will be displayed. You can select this option using the O key or browse through the other options using the scroll keys.

To leave an option or sub-menu, press the C key. This will take you back to the parent menu item.

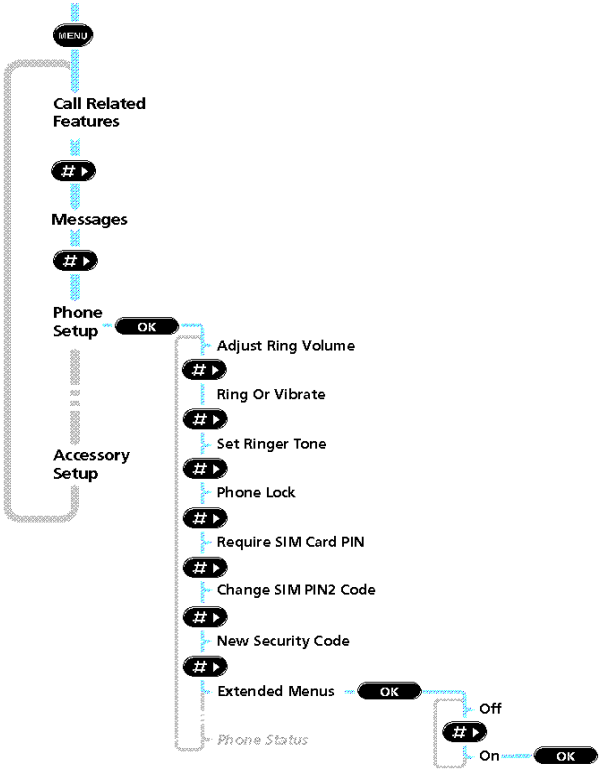
Menu Options with Security Codes

Some options are protected from misuse by requiring you to enter one of the security codes. In order to use these options, you must enter the requested code before proceeding.

Menu Navigation - A Working Example

The following steps will take you through how to switch the Extended Menus option on:

1. When the phone is in the standby mode, press the M key. This will access the Options menu and `Call Related Features` will be displayed.
2. Press the # key twice to go to the `Phone Setup` menu item.
3. Press the O key to select the sub-menu. The display will now show the `Adjust Ring Volume` menu option.
4. Press the # repeatedly until the `Extended Menus` sub-menu item is shown in the display.
5. Press the O key to select this item. You can now select between `On` or `Off`, the current setting will be shown with a `z` character. If the `z` character is next to `Off`, press # and then O to switch on the Extended Menus. If the `z` character is next to `On`, press C to leave the setting as it is.



O *Short, Extended and Personalised Menus*

With *Personality*™ you can personalise the menus by choosing which features you want readily available. The features that are less frequently used can be stored out of sight.

The menu diagrams in this manual show the condition of the menu settings when you first receive your phone. Some features are in the Short Menu and are shown in **bold** type. Other features are in the Extended Menu and appear in shaded *italics* - these features do not appear when you first scroll through the menus.

You can change which features appear in the Short and Extended Menus, and therefore personalise the menus, to suit your requirements.

If you want to move a feature from the Short Menu to the Extended Menu (or from the Extended Menu to the Short Menu), go to the feature and then hold down the O key until a prompt appears offering the following choices:

- Add the current feature to the Short Menu/Extended Menu.
- Leave the current feature in the Short/Extended Menu.

Select the option you want by pressing the O key.

A *The settings for some menu features cannot be changed.*

Using The Phone Book Menu

O What is the Phone Book?

You can store names and telephone numbers as entries in an electronic 'Phone Book'. These entries are stored in the *Personal Numbers list* in your phone or SIM card's memory, and in the *Fixed Dial list*[1] on your SIM card. Once stored, a number can be quickly retrieved and dialled.

Your phone can store 100 entries and the SIM card can store up to 155 entries in the Personal Numbers list. The number of SIM card entries will vary depending upon the type of SIM card issued by your Cellular Service Provider.

You can also store up to 20 entries in a Fixed Dialling list if you have this feature. Fixed Dialling allows you to limit use of your phone to particular numbers, or, if you wish, to country codes, area codes, or other prefixes of your choosing.

Each Phone Book entry comprises:

- A telephone number. Up to 32 digits can be stored, but this is reduced to 20 digits for SIM card locations.
- A name. Up to 16 characters for phone locations. Up to 50 characters for SIM card locations, but typically 10 or less.
- A location label - from 1 to 255 in your Personal Numbers list, or 1 to 20 in your Fixed Dial list.

Postscripting

This allows you to make use of area codes and other prefixes previously stored in your Phone Book when making a call.

To use postscripting, select the Phone Book entry containing the prefix and then simply enter the rest of the number and press O to make the call.

You can also use postscripting if you want to call a number similar to one you have stored in your Phone Book. Retrieve the number from the Phone Book, delete the relevant digits and then enter the new number.

A *Postscripting a number does not overwrite the entry in the Phone Book.*

1. *Availability of the Fixed Dialling feature depends on the type of SIM card you have.*

How to Enter Alphabetic Characters

The 0 , 1 ,... ..., 8 and 9 keys are used to enter alphabetic characters, for example when storing names in the Phone Book or when creating messages.

For example, if you press the 5 key, the first displayed character will be J. If this is not the required character, then you can press the same key again to show K. Another press will display L, another... ...will display 5. Your phone will continue to scroll through the characters available on the selected key with each new key press.

A long press of any of the keys will switch all the characters to lower case, a second long press will switch back to upper case.

To enter the next character press the appropriate key. If, however, the next character is on the same key as the previous character you will first need to press the # key. Pressing the # key a second time will produce a space.

If a mistake has been made, you can go back to the incorrect character by pressing * .

Characters can be removed from the display by pressing the C key.

The character before the cursor (Ö) is the character which will be deleted.

Press the O key to store the information.

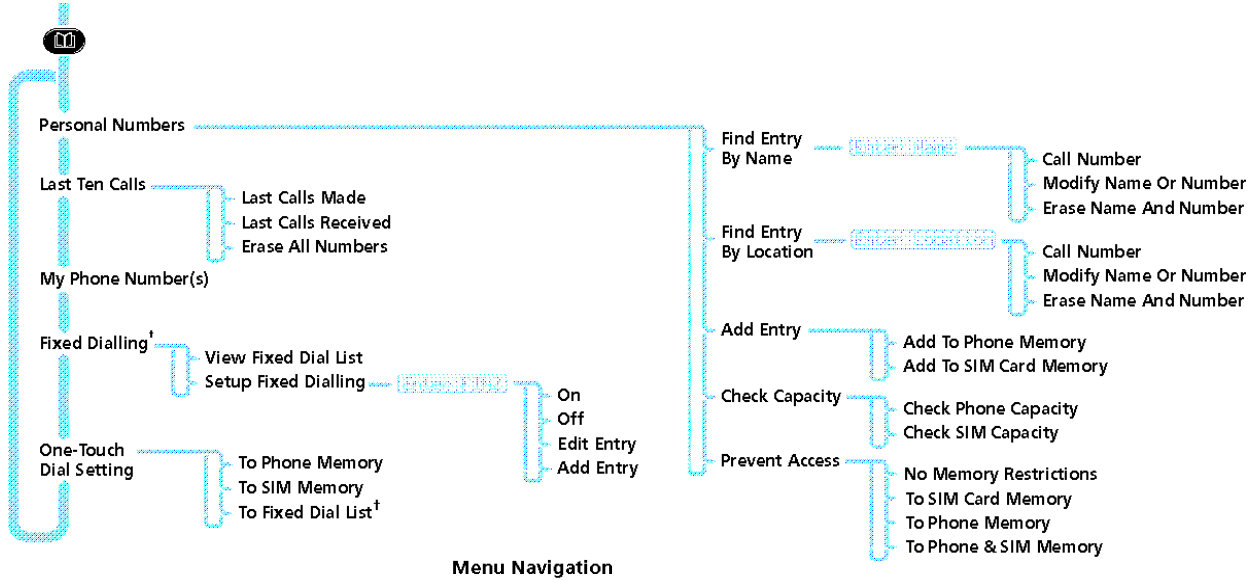
Available Characters

Press the appropriate keys to get the following characters:

1	Space . ? ! , Ÿ & : " ( ) ' ` @ % ¡ ¢ 1
	Space . ? ! , Ÿ & : " ( ) ' ` @ % ¡ ¢ 1
2	A B C [® ± ¼ ¾ © 2
	a b c { ¯ ± ½ ¾ © 2
3	D E F ° ¿ ¤ ² 3
	d e f ° ¥ ¤ ² 3
4	G H I À § 4
	g h i À § 4
5	J K L Á 5
	j k l Á 5
6	M N O] \ « ¨ µ 6
	m n o } | ¬ ¨ µ 6
7	P Q R S Â ¾ ¸ 7
	p q r s Â ¾ ¸ 7
8	T U V ¹ ^ ¦ 8
	t u v ¹ ~ ¦ 8
9	W X Y Z º · 9
	w x y z º · 9
0	+ - x * / = > < # 0
	+ - x * / = > < # 0

The top line(s) for each key show the upper case characters, the lower line(s) show the lower case.

The Phone Book Menu



Menu Navigation

† Availability depends on the type of SIM card.

Personal Numbers

The Personal Numbers sub-menu is used for creating and managing your list of personal numbers.

Find Entry By Name

This option is used to select a telephone number from a list of alphabetically sorted Phone Book names.

Once selected, this option will display the message `Enter Name`. You can enter a maximum of three characters from a name but you do not need to enter all three characters to begin a search.

The Phone Book entries will be searched and the first alpahabetically matching entry will be displayed.

If there isn't a name matching your entry, the nearest alpahabetically matching entry will be displayed.

If you do not enter any name information, the first alphabetical entry will be displayed.

If there are no names stored, `No Names Stored` will be displayed.

To display adjacent Phone Book entries use the * and # keys. When the desired name is displayed press the O key to select it. The phone will now enter the 'Call Number', 'Modify Name Or Number' or 'Erase Name And Number' options sub-menu.

Find Entry By Location

L *Press* Q **Location**.

This option is used to select a telephone number from a list of numerically sorted Phone Book locations.

Once selected, this option will display the message `Enter Location`. You can now enter a location number. If the entered location is not valid, a timed message `Range 1-XXX` will be displayed and the phone will return to the `Enter Location` menu item.

The Phone Book entries will be searched and an entry will be displayed.

If you enter a location number for which there is no entry, `Location Empty` will be displayed and the nearest non-empty location will be selected instead.

If you did not enter a location, the first numerical entry will be displayed.

If there are no numbers stored, `No Numbers Stored` will be displayed.

To display adjacent Phone Book entries use the * and # keys. When the desired name is displayed press the O key to select it. The phone will now enter the 'Call Number', 'Modify Name Or Number' or 'Erase Name And Number' options sub-menu.

Call Number, Modify Name Or Number or Erase Name And Number Options

Once a Phone Book entry has been selected, it can be called, modified or deleted.

Call Number

This option is used to call the selected Phone Book telephone number.

Modify Name Or Number

This option is used to change the selected Phone Book entry.

The entry's current telephone number and name will be presented, in turn, for modification. You can accept the current settings or modify as required.

Erase Name And Number

This option is used to erase the selected Phone Book entry.

Simply press the O key when the phone displays the message `Erase Name And Number`. The option will display the timed message `Erased XXX` and then return to the `Find Entry` menu item.

Add Entry

This option is used to add (store) entries to the Phone Book. You can choose to add the new entry to either the phone or SIM card memory locations.

Add To Phone Memory, Add To SIM Card Memory

Once you have selected the destination of the new entry, you will be asked to enter the telephone number, name and location number of the new entry.

The last telephone number displayed will be presented by default; it can be used or discarded as required.

If the entered location is not valid, a timed message `Range YYY-ZZZ` will be displayed and the phone will return to the `Enter Location` prompt. If the chosen location is currently used by another entry, you will be asked for confirmation that the location can be overwritten.

If you do not supply a location number, the next available location will be used.

When the new entry has been entered, a timed message `Stored XXX` will be displayed.

Check Capacity

This option is used to check the number of free Phone Book entries in the phone or SIM card memory areas.

Check Phone Capacity, Check SIM Capacity

Once selected, a timed message `XX Unused Locations` displays the requested information.

Prevent Access

This option enables you to prevent access to the Personal Numbers list.

To SIM Card Memory, To Phone Memory, To Phone & SIM Memory, No Memory Restrictions

You can prevent access to all entries in the SIM card memory, the phone memory or both the phone and SIM card memory. To cancel all access restrictions use the No Memory Restrictions option.

When you change the restrictions, you will be requested to enter the Security Code before the change is made.

Last Ten Calls

These options can be used to call the most recently used phone numbers.

Once an option has been selected, use the < and > keys to scroll through the list of phone numbers. Press the O key to call the displayed number.

- *You can use postscripting to modify a number once you have retrieved it from either of the Last Ten Calls lists.*

Last Calls Made

This option can be used to redial the phone number of any one of the last ten calls made.

Last Calls Received

This option can be used to redial the phone number of any one of the last ten calls received.

- *You will only see numbers in the Last Calls Received list if you have Caller Line Identification.*

Erase All Numbers

This option erases all the numbers stored in your Last Ten Calls Made and Last Ten Calls Received lists.

My Phone Number(s)

This option allows you to access your cellular phone, fax and data numbers so that you can retrieve or modify them when required. For example, if you have difficulty remembering your cellular phone number, store it with the name My Phone and then you will be able to retrieve the number as required.

The My Phone Number(s) list is stored on your SIM card.

When you select this item, the first location will be displayed. Use the < and > keys to scroll through the phone numbers stored.

To enter or change a number, scroll to the location and press O. You will be prompted to enter a phone number and then a name. Press O to store the information.

A *Depending on your Cellular Service Provider, you may find that one or more of the entries in the My Phone Number(s) list will have been defined. You may not be able to change these predefined entries.*

Fixed Dialling

A *Availability of the Fixed Dialling menu depends on the type of SIM card.*

This feature allows you to limit use (typically third-party use) of your phone to a predefined list of telephone numbers or, if you wish, to a list of country codes, area codes, or other prefixes of your choosing.

When Fixed Dialling is switched on, the only numbers that can be dialled from your phone are those stored (or whose prefix is stored) in the Fixed Dial list. If you attempt to dial any other number (apart from an emergency number), the message Restricted will be displayed. You will not be able to make fax or data calls.

To make a call when Fixed Dialling is switched on, either dial the number manually, or select it from the Fixed Dial list and press O.

Up to 20 entries can be stored in the Fixed Dial list. The list is stored on your SIM card.

! *This option may be affected by the Call Barring setting.*

View Fixed Dial List

This option allows you to scroll through the numbers in the Fixed Dial list. When you find the number you want, press O to make the call.

Setup Fixed Dialling

This option allows you to switch Fixed Dialling on or off and to enter or change entries in the Fixed Dial list.

You will be prompted to enter your PIN2 security code when you select this option.

On

Switches fixed dialling on.

Off

Switches fixed dialling off.

Edit Entry

Modifies or clears an entry in the Fixed Dial list. When you select this option, the first non-empty location in the list will be displayed. Scroll to the entry you want to change and press O. You will be prompted to edit the phone number and the name. To erase the entry, press C.

Add Entry

Adds a phone number and name to the Fixed Dial list. When you select this option you will be prompted to enter the phone number, name and a location number. If you do not specify a location number, it will be stored in the next available location.

- *When setting up your Fixed Dial list, you may want to reserve the first nine locations for phone numbers you wish to One-Touch Dial. See also 'One-Touch Dial Setting'.*

One-Touch Dial Setting

This option allows you to specify which Phone Book list can be One-Touch Dialled.

To Phone Memory

Switches One-Touch Dialling to your Personal Numbers list stored in phone memory (locations 1 to 9).

To SIM Memory

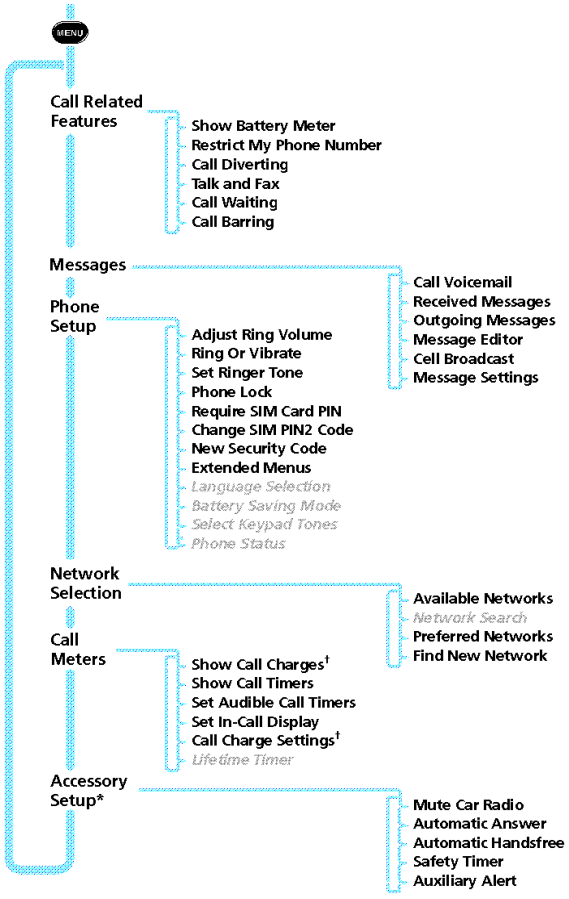
Switches One-Touch Dialling to your Personal Numbers list stored on your SIM card (locations 101 to 109).

To Fixed Dial list

- *This option is only available if you have Fixed Dialling.*

Switches One-Touch Dialling to your Fixed Dial list (locations 1 to 9).

Using the Options Menu



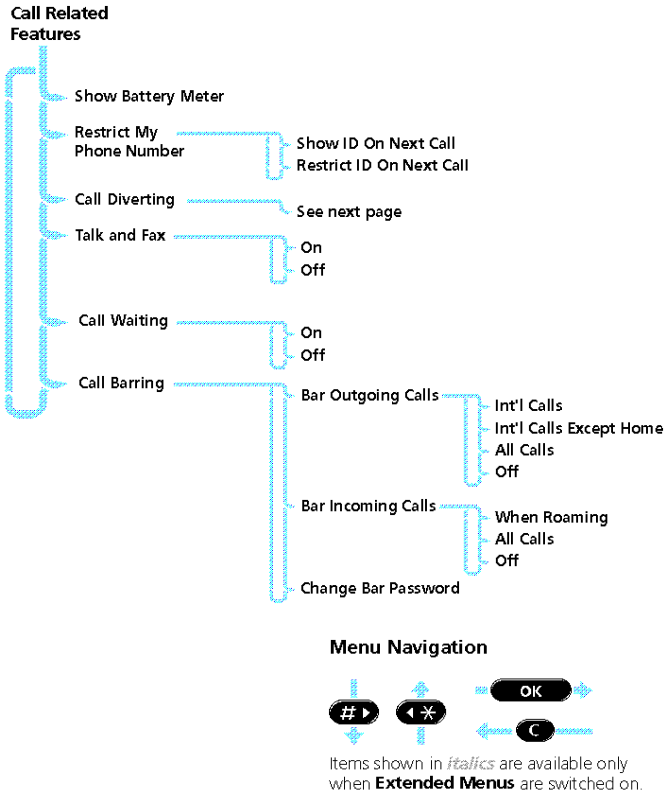
Menu Navigation

Items shown in *italics* are available only when **Extended Menus** are switched on.

† Availability depends on the type of SIM card.

* The **Accessory Setup** option is available only when a car kit is fitted.

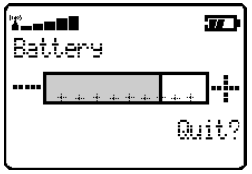
Call Related Features Menu



Items shown in *italics* are available only when **Extended Menus** are switched on.

Show Battery Meter

This option displays the approximate amount of battery capacity remaining, for example:



Restrict My Phone Number

'Restrict My Phone Number' is a network feature. You will need to subscribe to one of the two Caller Line Identification restriction features with your Cellular Service Provider.

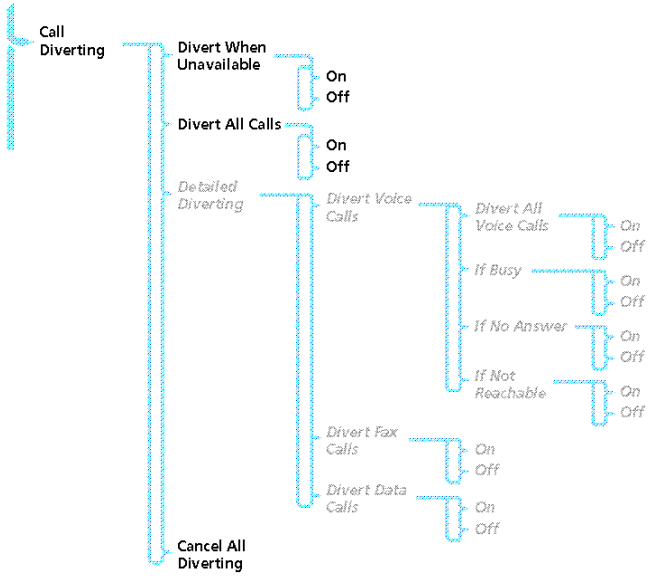
Show ID On Next Call

Your phone number is sent with the next attempted call, after this your phone number will not be sent until you re-select this option.

Restrict ID On Next Call

Your phone number will not be sent with the next attempted call, after this your phone number will be sent with calls until you re-select this option.

O *Call Diverting*



Call diverting is a network feature. If your phone is unavailable, or you do not wish to receive calls, incoming calls can be diverted to other phone numbers.

This option can be used to:

- Divert all incoming calls unconditionally.
- Divert incoming calls whenever your phone is unavailable.

- Divert calls to different numbers, depending on the call type and the current status of your phone.
- Reset all diversion options to off.

A *You cannot change the call divert settings when you are out of GSM coverage.*

After selecting any of the call divert options there will be a short delay while the phone asks the network for the current setting.

Divert When Unavailable

This option will enable you to divert all incoming calls to a single number, whenever your phone is unavailable.

The option has two settings, `On` or `Off`.

If you change the setting to `On`, you will be asked to enter a diversion phone number using the digit keys.

A *When `On`, Divert When Unavailable takes priority over detailed diversion settings.*

Divert All Calls

This option will enable you to *unconditionally* divert all incoming calls to a single number.

The option has two settings, `On` or `Off`.

If you change the setting to `On`, you will be asked to enter a diversion phone number using the digit keys.

A *When `On`, Divert All Calls takes priority over all other diversion settings.*

Detailed Diverting

These options will enable you to divert calls to different numbers, depending upon the call type and the current status of your phone.

Each of the following detailed diverting options operate in the same way.

Each option has two settings, `On` or `Off`.

If you change the setting to `On`, you will be asked to enter a diversion phone number using the digit keys.

A *Detailed diversion settings are ignored while Divert All Calls or Divert When Unavailable are `On`.*

Divert Voice Calls

`Divert All Voice Calls`

When selected, this option will unconditionally divert all incoming calls. You will have no opportunity to answer an incoming call.

`If Busy`

This option will divert incoming calls if your phone is busy.

`If No Answer`

This option will divert incoming calls if you do not answer the call.

`If Not Reachable`

This option will divert incoming calls if your phone cannot be contacted by the network.

Divert Fax Calls, Divert Data Calls

When selected, these options will divert incoming 'Fax' and 'Data' calls.

Cancel All Diverting

This option will enable you to cancel the diversion of incoming calls.

! *This option resets all diversion settings to* `Off` *and removes all diversion numbers.*

Talk and Fax

This is a network feature that allows you to speak and then send or receive a fax during the course of a single call.

A *Your phone supports a data and fax transmission speed of up to 9600 bps.*

Before making a Talk and Fax call, ensure that:

- Your phone is "fax-ready" (it has been switched off, connected to the fax, then switched back on). Connecting your phone to the fax in the middle of the call will not work.
- The Talk and Fax mode is set to `On`.

A Talk and Fax call automatically switches to fax mode when you start sending the fax. While the fax is being transmitted, the message `Fax in progress` will be displayed. The call automatically ends when the fax transmission is complete. You cannot switch back to voice mode in the same call.

A *While a Talk and Fax call is active, incoming call services like Call Waiting and Call Holding are suspended.*

If you receive a Talk and Fax call when:

- Your phone is not fax-ready - you can only talk.
- Your phone is fax-ready but Talk and Fax mode is off - the call is automatically routed to your fax (you cannot talk).

On

Switches Talk and Fax mode on for the next and all subsequent calls.

Off

Switches Talk and Fax mode off for the next and all subsequent calls.

O *Call Holding and Call Waiting*

Your phone supports the GSM network options of Call Holding and Call Waiting. Using these options you can place a current phone call on hold and accept an incoming call or start a second call.

The Call Waiting menu item has two settings On or Off. If you select Off, you will be not be notified of waiting calls. The person trying to contact you will either receive the busy tone, or be diverted by the 'Detailed Diverting - If Busy' option.

If Call Waiting is On, you will be notified of a waiting call by an audible alert and by the message `Call Waiting - Answer?`. You can press the O key to accept the waiting call, or use the M key to scroll to an alternative option and then press O.

A *If you have Caller Line Identification, the caller's number or name is displayed instead of the Call Waiting message.*

Call Holding and Call Waiting Scenarios

The display will automatically change according to the status of your current call (or calls) and will propose the option that you are most likely to want. Press O to accept this option or press M to scroll through the alternative options. By following this procedure you will find that even the triple combination of an active call, a held call, and a call waiting is easy to manage.

The following points summarise the more common situations:

- To end the active call, press O. If you have a call on hold it is automatically connected.
- To put the active call on hold and make another call, press M and select the `Hold Call` option, then press M again and select the `Make New Call` option[1].
- To put the active call on hold and reconnect a held call, press M and then select the `Switch Calls` option.
- To accept a waiting call, press O. The active call will be placed on hold. If you prefer to end the active call before accepting the waiting call, press M and select the `End Active Call` option, or `End Held Call` option as appropriate.
- To reject a waiting call, press M and select the `Reject Call Waiting` option (or simply press the C key).

A *If you have an active call, a call on hold and a call waiting, you cannot accept the waiting call until you end either the active call or the held call.*

1. *A quicker method of making another call is to enter the number to be called directly. As soon as you press the first digit, the display will change to* `Call?`*. This will disappear three seconds after the last key press, but if you press O before then, your phone will place the current call on hold and attempt to call the number entered.*

Call Holding and Call Waiting Messages

During Call Holding and/or Call Waiting operations, your phone may display one or more of the following messages:

`Trying`
A request to hold the active call, or swap the active call with a held call, has been made.

or

A request to reconnect the held call has been made.

`Hold Failed`
The request to hold a call has been unsuccessful.

`Cannot Hold Second Call`
A call is already on hold, you cannot place two calls on hold at the same time.

`Reconnect Failed`
The held call could not be made active again.

`Busy Try Later`
Your phone is still working on a previous command. Wait a short time before repeating the command.

`Anonymous`
The person who is calling you has blocked their number from appearing on your phone.

`Unavailable`
The network is unable to provide the caller's number.

O *Call Barring*

Call barring is a network feature which can be used to selectively bar outgoing and incoming calls.

If you change the barring setting, you may be asked to enter your barring password. There will be a short delay while the phone notifies the network of the new setting. When the change has been made by the network, the phone will display a confirmation message.

The *initial* password will be supplied to you by your Cellular Service Provider when you subscribe to this service.

A *This option may be affected by the Fixed Dialling setting.*

Bar Outgoing Calls

After selecting this option, there will be a short delay while the phone asks the network for the current setting.

Int'l Calls

When selected, this option will bar outgoing international calls.

Int'l Calls Except Home

When selected, this option will bar outgoing international calls, except those to your home country.

All Calls

When selected, this option will bar all outgoing calls, except emergency calls.

Off

When selected, this option will disable all call barring for outgoing calls.

Bar Incoming Calls

After selecting this option, there will be a short delay while the phone asks the network for the current setting.

When Roaming

When selected, this option will bar incoming calls when you are roaming.

You may wish to select this option, as some Cellular Service Providers charge an additional fee for receiving calls when you are roaming.

All Calls

When selected, this option will bar all incoming calls.

Off

When selected, this option will disable all call barring for incoming calls.

MENU

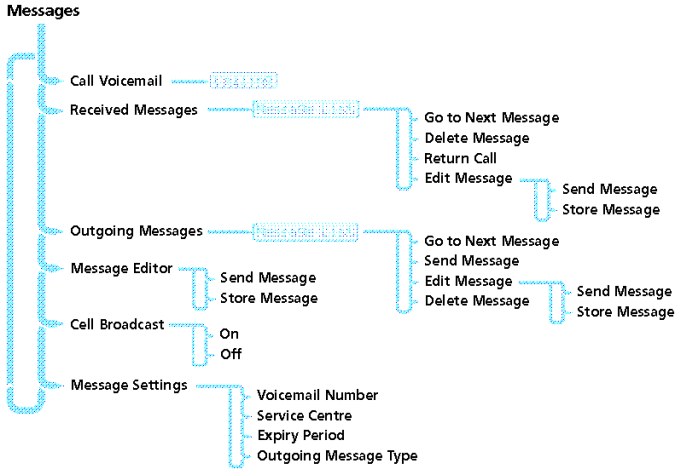
Change Bar Password

This option can be used to change the call barring password.

After selecting this option, you will be asked to enter the current password.

You will then be asked to enter, and then re-enter, your new, **4 digit**, barring password. When the change has been made by the network, the phone will display a confirmation message.

Messages Menu



Menu Navigation

Your phone supports the two GSM message features: Short Message Services (SMS) and Cell Broadcast.

SMS Messages

These are text messages that are sent specifically to and from your phone number.

When an SMS message is received, your phone:

1. Makes three short alert tones (depending on the 'Ring or Vibrate' setting).
2. Displays the o (messages) icon.
3. Stores the message for later viewing, if there is space. If there is not enough space, the o icon will flash. One or more messages must be removed before the message can be stored.

Your Cellular Service Provider will transmit a message for a limited amount of time. If a memory location is not made available before the message is removed from the network, then you will not be able to receive or read it.

Cell Broadcast Messages

These are general messages, broadcast to a group of phones and can only be received when your phone is in standby mode.

These messages are broadcast in numbered 'channels' and, in general, each channel will tend to carry one particular type of information.

Typical cell broadcast channels could have information on local weather conditions, traffic reports or stock market prices. Please contact your network operator for a list of available channels and the information they supply.

When the message has scrolled across the display, the beginning of the message will be shown until you either remove it or a new message arrives.

How to Read SMS Messages

You can use the scroll keys (M , < and >) to scroll through messages in either the Received Messages or Outgoing Messages lists.

To display a specific message, enter the message number, for example press 5 to display the 5th message. If the message does not exist, `Invalid Msg Number` will be displayed.

Alternatively, to display the next message, press O and select `Go To Next Message`.

How to Create and Edit SMS Messages

Use the *Message Editor* to create or modify text messages. When you enter the editor, the last message that was edited will be displayed. Press and hold C to clear the message and start a new one, or modify the message displayed. For an explanation of how to enter text, see 'How to Enter Alphabetic Characters' in the ***Using The Phone Book Menu*** section.

Press O once you have completed your message. You will then be presented with the following options:

`Send Message` - If you select this option you will be prompted for a phone number, enter the number and then press O to send the message.

`Store Message` - Select this option to store your edited message in your Outgoing Messages list.

▲ *If you don't store the message after it has been edited, you will lose all your changes as soon as you select another message to be edited.*

O Call Voicemail

Once selected, this option will leave the Messages menu and automatically make a phone call to the current voicemail number. The display will show `Calling` and standard call operations can be performed.

The voicemail phone number can be entered by selecting the 'Voicemail Number' option in the 'Message Settings' sub-menu.

Received Messages

This option is used to view and manage any SMS messages that have been sent to your phone number.

When selected, this option will display a message indicating the total number of messages and how many of these are new. If there are no messages `No Messages` will be displayed.

If there are messages, the new messages will be displayed first, followed by the old. Repeated presses of the M key will display the whole message, when it was sent and the phone number who sent it (if available).

Once you have read a new message it will automatically become old.

See 'How to Read SMS Messages' for more information on navigating through the messages.

Press the O key, when viewing any message, to enter the 'Go to Next Message', 'Delete Message', 'Return Call' and 'Edit Message' sub-menu.

Go to Next Message

This option will display the next received message.

If you are currently reading the last message in your list then this option will take you back to the top of the list.

Delete Message

This option will delete the currently viewed message

Return Call

This option can be used to call the person who sent you the message, if their number has been included by the network, or a number that has been included in quotes " " in the message.

Edit Message

This option allows you to use the Message Editor to edit the selected message and then to either send the modified message and/or store it in your Outgoing Messages list. See 'How to Create and Edit SMS Messages' for more information on using the Message Editor.

Outgoing Messages

This option is used to view and manage any outgoing messages. These messages will be stored on your SIM card. When you select this option, the total number of messages will be displayed followed by the first message in the list.

A *You cannot send an outgoing message until the Message Service Centre number has been set. See 'Message Settings'.*

Press the O key, when viewing any message, to enter the 'Go to Next Message', 'Send Message', 'Edit Message' and 'Delete Message' sub-menu. See 'How to Read SMS Messages' for more information on navigating through the messages.

Go to Next Message

This option will display the next outgoing message.

Send Message

If you select this option you will be prompted for a phone number, enter the number and then press O to send the message.

Edit Message

This option allows you to use the Message Editor to edit the selected message and then to either send the modified message or store it in your Outgoing Messages list. See ‘How to Create and Edit SMS Messages’ for more information on using the Message Editor.

Delete Message

This option will delete the currently viewed message.

Message Editor

The Message Editor is used to edit the currently selected message and then to either send the modified message or store it in your Outgoing Messages list. See ‘How to Create and Edit SMS Messages’ for more information on using the Message Editor.

Cell Broadcast

MENU

This option is used to set the cell broadcast settings. The option has two settings `On` or `Off`.

If you change the setting to `On`, you will be asked to enter the channel you wish to receive information from.

Please contact your Cellular Service Provider for a list of available channels and the information they provide.

While a broadcast message is scrolling across the display you can stop and start it by pressing * . Press # to restart the message from the beginning. If you want to remove the message from the display, press C followed by O .

A *If you need to use the * and # keys for their normal functions while you are receiving a cell broadcast message, you must first remove the message.*

Message Settings

Voicemail Number

This option is used to enter a phone number which will be used by the ‘Call Voicemail’ option.

If there is already a Voicemail Number, this will be shown in the display. This can be used, modified or deleted as desired.

Service Centre

Before you can send any messages you must use this option to enter your Message Service Centre number. This number is obtained from your Cellular Service Provider.

Expiry Period

You can use this option to specify the maximum time, in hours, that your unforwarded messages are to remain with the Message Service Centre before being deleted. When you select this option, the current expiry period will be displayed (the default is 24 hours).

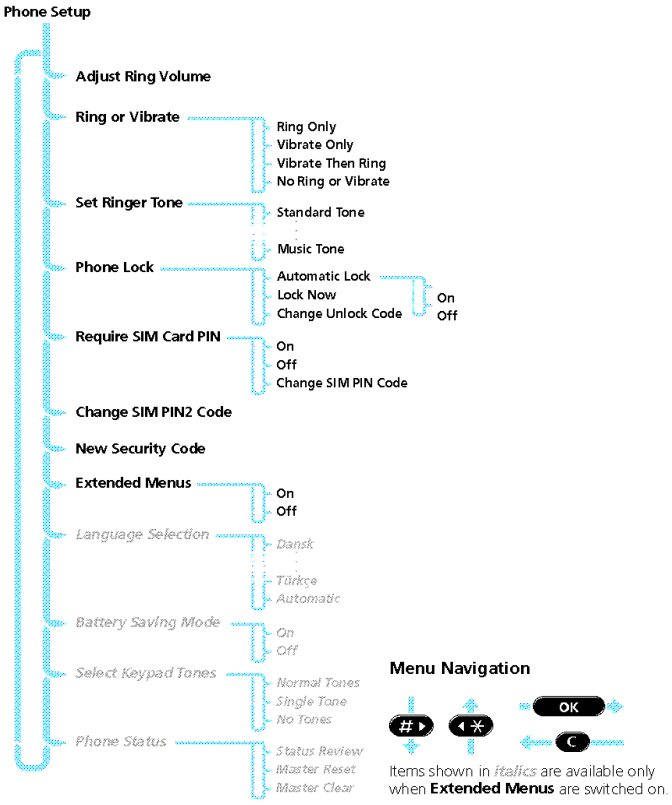
The maximum value you can enter is 10584, though the real limit will depend on your Message Service Centre.

Outgoing Message Type

This option is network dependent and can be used to specify the format of your outgoing messages. You can select from the following message types: `Text` (default), `Fax`, `X400`, `Paging`, `E-Mail`, `ERMES` or `Voice`.

A *You do not need to select `Voice` to send messages to Voicemail boxes.*

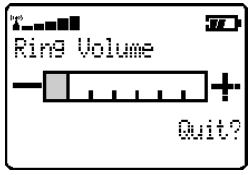
Phone Setup Menu



Adjust Ring Volume

This option is used to set the incoming call ring tone volume.

The volume will be displayed as follows:



Adjust the volume by pressing the volume keys on the side of your phone.

Ring or Vibrate

This option sets the way your phone alerts you to an incoming call. The options are:

- `Ring Only` - the phone will ring with the tone specified by the Set Ringer Tone option.
- `Vibrate Only` - the phone will vibrate using VibraCall™.
- `Vibrate Then Ring` - the phone will vibrate twice and then ring.
- `No Ring or Vibrate` - the phone will just display the `Call` message.

A *The setting you choose also defines the type of alert for an incoming SMS message (except that if you select Vibrate Then Ring, your phone will just vibrate).*

O *Set Ringer Tone*

This option sets the tone your phone will make when an incoming call is received.

Standard Tone

Your phone makes a standard ringing tone.

Single Ring Tone - Music Tone

When selected, your phone will produce one of these alternative ringer tones.

- *If you select the Single Ring Tone option, the phone will only ring once when a call is received.*

O *Phone Lock*

This option is used to set, and change, the unlock code.

The unlock code can be set to protect your phone from unauthorised use. It can be set to automatically lock your phone each time it is switched on.

The unlock code is a four digit number which is set at manufacture to **1234**. This can be changed at any time by using the 'change unlock code' option.

Automatic Lock

This option can be used to automatically lock your phone each time it is switched on.

The option has two settings, `On` or `Off`.

Lock Now

This option can be used to immediately lock your phone. Once selected, your phone will be unusable until the unlock code is entered.

Change Unlock Code

This option is used to change the unlock code.

After selecting this option, you will be asked to enter the current security code before you can proceed.

You can now enter a four digit code to replace the old code.

- *By pressing the M key, you can access this option even when the phone is locked.*

Require SIM Card PIN

This option is used to set, and change, the PIN code.

The PIN code can be set to protect your SIM card from unauthorised use. If set to `On`, access to your SIM card will be restricted each time it is inserted or the phone is turned on.

The option has two settings, `On` or `Off`.

- *If the SIM card does not support PIN code disabling, these items will not appear.*

Change SIM PIN Code

This option is used to change the SIM card PIN code.

The 'Require SIM Card PIN' option must be set to `On` and you must enter the old PIN code before you can proceed.

You will be asked to enter a new, four to eight digit code to replace the old PIN code. The new PIN code must be entered again as confirmation.

! *If the PIN number is entered incorrectly three times in a row, your SIM card will automatically lock-up and the* `Blocked` *message will be displayed.*

Unblocking Your Phone

If you receive the `Blocked` message you will need to enter an unblock code and key sequence before you can use the phone.

A *The 8 digit PIN unblocking code will have been provided with your SIM card by your Cellular Service Provider.*

Enter the following key sequence to unblock your phone:

* * 0 5 * **Unblock Code** O
New PIN Code O **New PIN Code** O

The new PIN code must contain four to eight digits.

! *If this operation is performed incorrectly 10 times in a row, your SIM card will become permanently blocked.*

Change SIM PIN2 Code

This option is used to change your PIN2 security code.

When you select this option you must enter the old PIN2 security code before you can proceed.

You will be asked to enter a new, four to eight digit code to replace the old PIN2 security code. The new PIN2 security code must be entered again as confirmation.

! *If the PIN2 security code is entered incorrectly three times in a row, the* `Blocked` *message will be displayed.*

When the `Blocked` message is displayed, you are not allowed access to menu items that require you to enter the PIN2 code, for example ‘Setup Fixed Dialling’ and ‘Call Charge Settings’.

If you receive the `Blocked` message when you try to enter your PIN2 code, you will need to unblock and change the code using the following key sequence:

* * 0 5 2 * **Unblock Code** O
New PIN2 Code O **New PIN2 Code** O

A *The 8-digit unblocking code will have been provided with your SIM card by your Cellular Service Provider.*

! *If the PIN2 unblocking operation is performed incorrectly 10 times in a row, your PIN2 code will become permanently blocked.*

O *New Security Code*

The security code is used to control access to security and other options within the menus.

This option is used to change the security code, which is set at manufacture to **000000**.

Once selected, you will be asked to enter the current security code before you can proceed.

You will then be asked to enter a new, six digit code to replace the old security code.

A *In order to safeguard your phone, you should change your security code from the factory setting as soon as possible.*

O *Extended Menus*

L *Press and hold* M *. Extended Menus will be temporarily activated until you exit the Options menu.*

This option is used to switch the extended menus on or off.

If the extended menu option is switched off, you will not be able to access any of the extended features.

The option has two settings, `On` or `Off`.

O *Language Selection*

This option is used to change the language for display messages.

The option has multiple settings.

When you select a language, all further display prompts and help messages will be in the selected language.

Battery Saving Mode

This option can help you to conserve battery power. Also known as DTX (Discontinuous Transmission), this feature will cause your phone to operate at reduced power when you are not talking.

The option has two settings, `On` or `Off`.

O *Select Keypad Tones*

This option allows you to change or disable tones you hear when you press a key.

The option has three settings, `Normal Tones`, `Single Tone` or `No Tones`.

Phone Status

Status Review

This option can be used to view the current setting of menu options.

When selected, your phone will display a list of menu items which have been changed from the default setting. Press the M key to view the next item.

Master Reset

! *This option should be used with caution.*

This option is used to restore certain phone options to their original settings.

When selected, you will be asked to enter the security code. Once entered, the master reset option will perform the following operations:

- Cancel Automatic Answer, Audible Call Timers, In-Call Display Meter, Battery Save (DTX), Auxiliary Alert, Automatic Handsfree, Automatic Lock, Cell Broadcast and Talk and Fax Mode.
- Return Language Selection to Original.
- Restore Keypad Tones to Normal, Ringer Tones to Standard, Volume Level to Medium and Network Search frequency to Medium.
- Reset the expiry period for SMS messages to 24 hours and the Message Type to Text.

Master Clear

! *This option should be used with extreme caution, for example it will clear all the Phone Book entries from your phone memory.*

This option is used to restore certain phone options to their original settings.

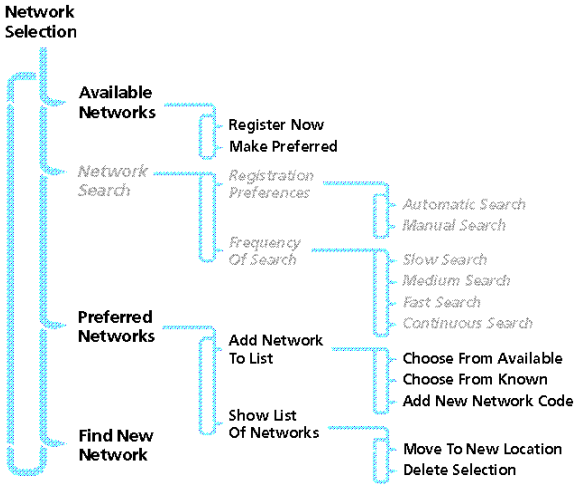
When selected, you will be asked to enter the security code. Once entered, the master clear option will perform the same operations as 'Master Reset', plus the following operations:

- Clear the Phone Book entries from phone memory (not from SIM memory)
- Clear the Last Calls Made and Last Calls received list
- Clear the Message Editor.
- Reset the Resettable Call Timers.

Master Clear does **not** clear the:

- Fixed Dial list
- My Number(s) list
- Charge Meters
- Received and Outgoing Messages list.

Network Selection Menu



Menu Navigation

Items shown in *italics* are available only when **Extended Menus** are switched on.

Network Selection

In order for the phone to make and receive phone calls, it must register with one of the available networks.

Your phone automatically searches for the last network used. If, for any reason, this network is unavailable, your phone will attempt to register with a new network.

When your phone needs to register with a new network, it will generate a sorted list of networks.The network list is sorted in the following order:

- The Home network.
- Networks from a preferred list.
- A random list of other networks found above a certain signal strength.
- All remaining networks in descending order of signal strength. Any forbidden networks, stored in the SIM card, will not be included in the sorted list.

Available Networks

When selected, this option will scan to see which networks are operating in your current location. When the scan is complete, press the M key to scroll through the list. When you see a network you wish to register with or store in your preferred list, press the O key. You will now enter the 'Register Now' and 'Make Preferred' sub-menu.

Register Now

Once selected, your phone will try to register with the selected network. If the registration fails, your phone will try to register in the normal way.

Make Preferred

Once selected, you will be asked where the selected network is to be located in the preferred list.

Network Search

These options determine how often your phone tries to register with a network and how the attempt is made.

Registration Preferences

This option determines how the phone tries to register with a network.

The option has two settings, `Automatic Search` or `Manual Search`.

Automatic Search Mode

In the automatic mode, the phone will try to register with the first network in the sorted list. If this is successful, your phone will display the network name and then enter the standby mode.

If registration is unsuccessful with one network in the list, your phone will try the next listed network. If your phone fails to register with any of the listed networks, it will start at the beginning of the list after a preset period. The preset period is determined by the 'Frequency Of Search' option.

Manual Search Mode

In the manual mode, the phone will present you with the sorted list of networks. Use the * , # and O keys to select one network from the list. Your phone will try to register with the selected network. If this is successful, the phone will display the network name and then enter the standby mode.

If registration is unsuccessful, your phone will present the list again after a preset period. The preset period is determined by the 'Frequency Of Search' option.

A *If the phone is turned off and then on again, it will revert to Automatic Search mode and register with a network in the order of the sorted list.*

Frequency Of Search

This option is used to determine how long your phone waits before attempting to re-register after a registration attempt has failed.

The option has the following settings: `Slow Search`, `Medium Search`, `Fast Search` or `Continuous Search`.

! *Fast and Continuous Search may use up a significant amount of battery power.*

O *Preferred Networks*

Add Network To List

This option enables you to add networks to your preferred list.

When selected, the 'Choose From Available' option will scan to see which networks are operating in your current location. When the scan is complete, press the M key to scroll through the list. When you see a network you wish to store in your preferred list, press the O key. You will be asked where the selected network is to be located in the preferred list.

The 'Choose From Known' option will, when selected, present you with a preset list of networks. Press the M key to scroll through the list. When you see a network you wish to store in your preferred list, press the O key. You will be asked where the selected network is to be located in the preferred list.

Select the 'Add New Network Code' option to enter network codes directly. Once entered, you will be asked where the network is to be located in the preferred list.

Show List Of Networks

This option is used to display the networks you have stored in your preferred list. In addition, pressing the O key will select the currently displayed entry and enter a move/delete sub-menu.

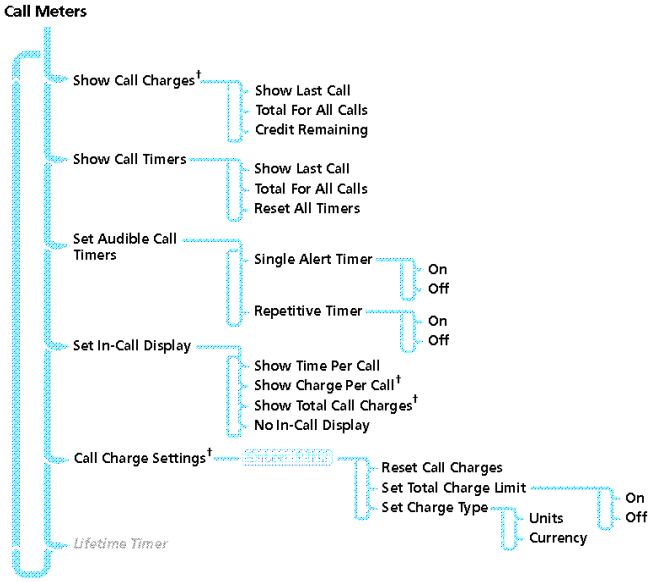
When 'Move to New Location' is selected you will be asked to enter a new location for the selected network.

When selected, 'Delete Selection' will remove the selected network from the preferred list.

Find New Network

When selected, the phone will try to register with a network in the normal manner, with one exception. When the registration attempt is made, your current network will be excluded from the list of those available. If the attempt fails, your phone will then try to re-register with the previous network.

Call Meters Menu



Menu Navigation

Items shown in *italics* are available only when **Extended Menus** are switched on.

† Availability depends on the type of SIM card.

Call Metering

Your phone has an internal metering system which can be used to provide you with individual and total call times or costs.

A *Call cost information is only available if you receive the Advice of Charge service. If you do not receive this service, then only time meters are available.*

The meter can be displayed during a phone call and audible tones can be generated to indicate the passage of call time.

Your phone can handle values up to 21 digits long, although during calls it can only display the last 12 digits. If the value exceeds 21 digits, then `Too Large` is displayed.

In addition, you can set a maximum charge limit so that your phone will monitor either the number of units used or the call cost, and then not allow the limit to be exceeded.

MENU

Show Call Charges

This feature allows you to display the cost of your calls or the amount of credit remaining. The figures are in phone units or currency depending on the setting of the `Set Charge Type` option.

A *Show Call Charges is only available if you receive the Advice of Charge service.*

Show Last Call

Displays the cost of your last chargeable call.

Total For All Calls

Displays the cost of all your chargeable calls since the charge meters were reset to zero using the 'Reset Call Charges' option.

Credit Remaining

Displays the difference between your total call costs and the limit specified by the 'Set Total Charge Limit' option. If there is no limit, `No Charge Limit Set` will be displayed.

Show Call Timers

This feature allows you to display the duration of your calls and to reset your time meters to zero.

If you receive the Advice of Charge service then all calls are timed. If you do not receive the Advice of Charge service then, depending on the model, either all calls or only outgoing calls are timed.

MENU

Show Last Call

Displays the duration of your last call.

Total For All Calls

Displays the duration of all your calls since the time meter was reset to zero using the 'Reset All Timers' option.

Reset All Timers

Sets the resettable time meters to zero. The Lifetime Meter is not resettable.

O *Set Audible Call Timers*

Your phone provides two programmable audible call timers:

- The 'Single Alert Timer' will sound a beep just once during a call, after a preset time has elapsed.
- The 'Repetitive Timer' will sound regular beeps during a call, at preset intervals.

In both cases, the timers will sound their beeps ten seconds before the end of the programmed time.

Set In-Call Display

This feature allows you to specify whether the time or charge meters are displayed during a call. If you do not have the Advice of Charge service, then only the time meter is available.

A *If a total charge limit has been set, then the in-call display always shows your remaining credit.*

Show Time Per Call

This option is used to display the time meter during calls. If you receive the Advice of Charge service, only the chargeable calls will be displayed.

Show Charge Per Call, Show Total Call Charges

A *These menu items are only available if you receive the Advice of Charge service.*

These options are used to display the call charges meter during and after chargeable calls. The meter shows phone units or currency depending on the setting of the 'Set Charge Type' option.

No In-Call Display

This option switches off in-call display of the charge/time meter.

Call Charge Settings

This feature allows you to customise your Advice of Charge settings. You will be prompted to enter your PIN2 security code before you can access the options.

- *This menu item is only available if you receive the Advice of Charge service.*

Reset Call Charges

This option resets your charge meters to zero.

Set Total Charge Limit

This option sets the maximum limit for call charges; once this limit has been reached, the network will refuse any further chargeable calls.

If you switch the charge limit `On`, you will be prompted to enter a new limit. Enter the amount as either units or currency depending on the setting of the `Set Charge Type` option. Units must be entered as whole numbers.

- *When the charge limit is* `On`*, you will not be able to make fax or data calls.*

Once a limit is set, the in-call display will show the remaining credit. When you reach your last two minutes, the warning message `Approaching Charge Limit` will be displayed and a warning alert will sound. The sound will be repeated when one minute remains. When the limit is reached the message `Charge Limit Reached` will be displayed and you will not be able to make any more chargeable calls.

Once the limit is reached the Total Charge Limit will need to be reset or switched off before any chargeable calls can be made.

Select `Off` to switch off the charge limit.

Set Charge Type

This option defines whether charge information is displayed as either phone units or currency.

Units

Sets the charge type to phone units.

Currency

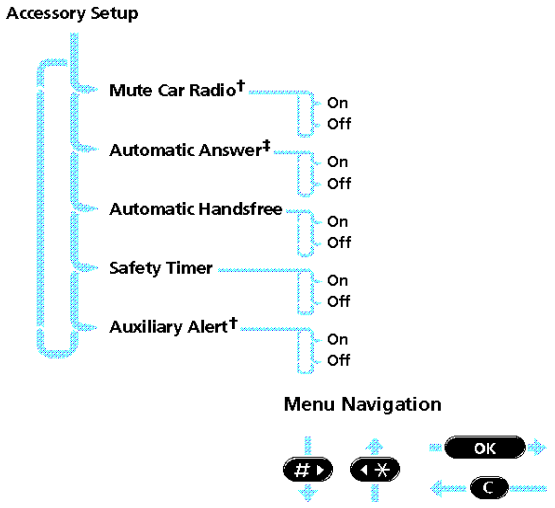
Sets the charge type to currency. You will be prompted to enter the `Currency Name`. Enter a 3-character notation, for example GBP for the UK, DEM for Germany or FFR for France. You will then be prompted for the `Charge Per Unit`. Enter the amount and press O .

Lifetime Timer

This option is used to display the total time of all calls made on your phone.

This meter can not be reset, the 'Reset All Timers', 'Master Reset' or 'Master Clear' options have no effect.

Accessory Setup Menu



† These options are mutually exclusive and can only be enabled by your local dealer.

‡ Availability depends on the type of car kit installed.

You will only be able to access this menu when your phone is mounted in a car kit.

Car kits can provide charging facilities and some provide connection to an external antenna for better reception. Your phone can also be linked to external microphones and speakers for hands free operation.

Your phone provides several options to complement the use of car kits.

O Mute Car Radio

This option can be used to mute your car radio when you make, or receive, a call when your phone is attached to the car kit. It must be enabled by your local dealer.

This option has two settings, `On` or `Off`.

A *This option will have no effect if your car radio does not have a mute feature, or if the car kit installation does not support this option.*

This option and the 'Auxiliary Alert' option are mutually exclusive. Only one of the two can be on at any time.

Automatic Answer

This option allows your phone to automatically answer an incoming call after two rings.

This option has two settings, `On` or `Off`.

A *If this option is* `On`*, we recommend that the 'Ring or Vibrate' option be set to* `Ring Only`*.*

This option will not work in conjunction with the Simple Micro Car Kit.

Automatic Handsfree

This option is used in conjunction with the 'Automatic Answer' option and a car kit, to transfer call conversation to external microphones and speakers. It is available only with selected car kits. Contact your *Motorola* representative for further details.

This option has two settings, `On` or `Off`.

Safety Timer

This option can be used to keep the phone on for a set period after the vehicle ignition has been turned off. This prevents the vehicle's battery from becoming drained and saves you from having to re-enter PIN and Unlock codes after every short stop.

As standard the 'Safety Timer' is set to 60 minutes. Once selected, this option can be adjusted to any value between zero and 999 minutes. When set to zero, this option is effectively switched off.

Auxiliary Alert

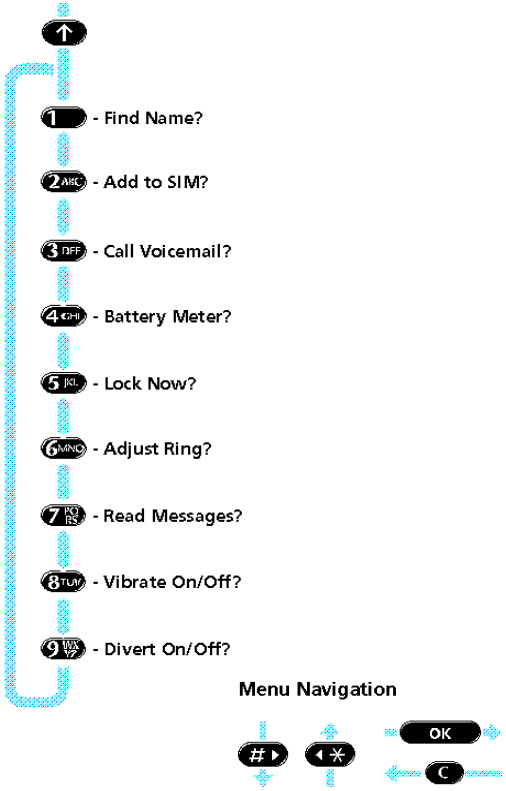
This option allows your phone to alert you of an incoming call by flashing your vehicle lights, or by sounding the horn. It must be enabled by your local dealer.

- *Some local regulations prevent the use of this option and, accordingly, this option may not be present on your phone.*

This option and the 'Mute Car Radio' option are mutually exclusive. Only one of the two can be on at any time.

MENU

Using the Quick Access Menu



A *The menu shown above represents the default features supplied with your phone.*

Although the features in your phone are available through easy access menus, some of the most commonly used features are also available in the Quick Access menu. Each feature in the menu is allocated a number from 1 to 9.

To use a Quick Access feature, press the quick access key (E) followed by the number of the feature, or press < or > to scroll through the menu and then press O .

You can change the features, and the positions of the features, available in the Quick Access menu - see 'Customising the Quick Access Menu'.

Each Quick Access feature is represented by an icon as well as the feature name. The currently selected icon is shown with a dark background.

B *Find Name?*

You will be prompted to `Enter Name`. Enter the first three characters of the name and press O . The first matching entry in the Phone Book will be displayed. Press O to call the number.

D *Find Location?*

You will be prompted to `Enter Location`. Enter the location number and press O . The first matching entry in the Phone Book will be displayed. Press O to call the number.

F *Add to Phone?*

You will be prompted to enter a phone number and then a name.

- *If you already had a number displayed, it will automatically be re-displayed when you select this feature.*

The number will be stored in the next available phone memory location. See ‘Add Entry’ for more information.

T *Add to SIM?*

You will be prompted to enter a phone number and then a name.

- *If you already had a number displayed, it will automatically be re-displayed when you select this feature.*

The number will be stored in the next available SIM card location. See ‘Add Entry’ for more information.

R *Call Voicemail?*

Your phone will make a call to your voicemail number.

- *You must have defined a Voicemail number in order to use this feature.*

See ‘Call Voicemail’ for more information.

G *Battery Meter?*

A bar graph indicating the approximate battery charge level will be displayed. The more bars displayed, the greater the charge level.

See ‘Show Battery Meter’ for more information.

H *Lock Now?*

Immediately locks your phone, you will not be able to use your phone until the unlock code is entered. See ‘Phone Lock’ for more information.

N *Adjust Ring?*

This option is used to display and to set the incoming call ring tone volume.

L *Vibrate On/Off?*

VibraCall™ will be switched either on or off depending on the current setting. If VibraCall™ is switched on, the ‘Ring or Vibrate’ setting changes to `Vibrate Only`. If VibraCall is switched off, the ‘Ring or Vibrate’ setting changes to `Ringer Only`. See ‘Ring or Vibrate’ for more information.

P *Divert On/Off?*

Unconditional call diversion will be switched either on or off depending on the current setting.

- *You must have defined a diversion number using the ‘Divert All Calls’ option in the Call Diverting menu in order to use this feature.*
- *You cannot switch call diverting on or off if you are outside GSM coverage.*

V *Switch Memory?*

Switches one-touch dialling between the phone and SIM memories depending on the current setting.

K *Read Messages?*

Your newest message will be displayed; you can then read, delete and edit messages as normal. See ‘Received Messages’ for more information.

U *Outgoing SMS?*

Your newest message will be displayed; you can then read, send, delete and edit messages as normal. See ‘Outgoing Messages’ for more information.

a *Message Editor?*

The last message that was edited will be displayed. Press and hold C to clear the message and start a new one, or modify the message displayed. See ‘How to Create and Edit SMS Messages’ for more information.

W *Received Calls?*

Displays the first entry in the Last Calls Received list. You can scroll through the list and call the numbers as normal. See ‘Last Calls Received’ for more information.

X *Call Charge?*

Displays the cost of your last chargeable call. See ‘Show Call Charges’ for more information.

Y *Call Timer?*

Displays the duration of your last chargeable call. See ‘Show Call Timers’ for more information.

Z *Talk and Fax?*

Switches Talk and Fax on for the next call only. See ‘Talk and Fax’ for more information.

b *Show My ID?*

Your phone number will be sent with the next attempted call; after this your phone number will not be sent until you reselect this option.

c *Restrict My ID?*

Your phone number will not be sent with the next attempted call; after this your phone number will be sent until you reselect this option.

Customising the Quick Access Menu

You can change the features in the Quick Access menu to suit your personal preferences.

To customise the menu:

1. Press E and scroll to the menu item you wish to change.
2. Press and hold O to access the list of features available. The currently selected feature will be displayed.
3. Scroll through the list until you find the feature you wish to store in the Quick Access menu; press O .
4. `Completed` will be displayed to confirm that the feature has been stored.

The items in the Quick Access list will appear in the following order:

- Find by Name
- Find by Location
- Add Entry to Phone
- Add Entry to SIM
- Call Voicemail
- Battery Meter
- Phone Lock Now
- Ring Volume
- VibraCall On or Off
- Divert All On or Off
- Switch Memory
- Read Messages
- Outgoing Messages
- Message Editor
- Last Calls Received
- Last Call Charge
- Last Call Timer
- Talk and Fax
- Show My ID Next Call
- Restrict My ID

Accessories

The following accessories have been designed to work with your cellular phone. Additional accessories may be available and are packaged separately. Please refer to your local service provider or retail outlet for more information.

Desktop E•P Charger (SPN4216)

The Desktop E•P Charger allows you to charge a phone with a battery attached and a spare battery at the same time. The charging status for each battery is indicated by LEDs at the front of the charger.

- *The Desktop E•P Charger must be used with the Travel Battery Charger - Wall Adapter (SPN4221 or SPN4222).*

Travel Battery Charger - Wall Adapter (SPN4221 - UK or SPN4222 - Euro)

The Travel Battery Charger connects to the Desktop Rapid Charger or directly to the phone. When connected directly to the phone, it charges the battery and also provides dead battery operation.

Cigarette Lighter Adapter (SLN9933)

The Cigarette Lighter Adapter connects to your phone and allows you to charge your phone's battery when driving. When the phone is in use, the adapter overrides the battery therefore preserving battery life. The adapter also provides dead battery operation.

The Cigarette Lighter Adapter is also available with a connection to an external antenna (SLN9934).

Passive Hang-up Cup (SYN4932)

The Passive Hang-up Cup is a simple holder for mounting your phone in the car.

Handsfree Car Kit (S4386)

The Handsfree Car Kit allows you to safely operate your phone while driving. The car kit provides a responsive directional microphone and direct antenna connection. While connected to the phone, the car kit also charges the battery.

PC Cards
CELLect™1 (S4154)
CELLect™2 (S5253-UK, S5254-Germany)

Both PC Cards allow you to send and receive data and fax calls using your phone and a computer with a PCMCIA Type II slot.

The CELLect™2 card also contains a landline modem for connection to the conventional telephone network. This gives you both wired and wireless connection options in a single PC card.

Compatible Accessories

If you already have existing accessories for a MicroTAC phone, the following accessories are recommended for use with this phone:

Simple Micro Car Kit (no hands free)*	S3060
Rapid Charger Base	SLN9347
Transformer (UK)	SPN4111
Transformer (Euro)	SPN4112

** Requires a new connector cable (SKN4636).*

Other MicroTAC accessories may work with your phone but with some limitations. Please contact your *Motorola* representative for details.

What to do if...

You can't switch your phone on	*Check the battery.* Is it charged, properly fitted and are the contacts clean and dry? See 'Important Battery Information'.
You can't make calls	*Check the antenna.* Is it fully extended? *Check the signal strength meter in the display.* If the signal is weak, move to an open space or, if you are in a building, move closer to a window. *Check the Network Selection settings.* Try Manual Selection, or try another network. See 'Network Search'. *Check your Operator coverage map*. *Is* `Restricted` *displayed?* Check the Call Barring and Fixed Dialling settings. *Has the call charge limit been reached?* Use your PIN2 code to reset the limit or contact your Service Provider. See 'Set Total Charge Limit'. *Has a new SIM card been inserted?* Check that no new restrictions have been imposed.
You can't receive calls	*Check the antenna.* Is it fully extended? *Check the signal strength meter in the display.* If the signal is weak, move to an open space or, if you are in a building, move closer to a window. *Check the Call Diversion and Call Barring settings.* *Check the Ringer and VibraCall settings*. If both are off, there is no audible alert. See 'Ring or Vibrate'.
Your phone won't unlock	*Have you inserted a new SIM card?* Enter the new PIN code. See 'Entering Your SIM Card PIN Code'. *Do you have a replacement phone?* Enter the default phone unlock code - 1234. *Have you forgotten the unlock code?* Press M to change the unlock code (you will need your security code).
Your PIN is blocked	*Enter the PIN unblocking code supplied with your SIM card (see 'Unblocking Your Phone').*
Your PIN2 is blocked	*Enter the PIN2 unblocking code supplied with your SIM card (see 'Change SIM PIN2 Code').*
Your SIM card won't work	*Is the card inserted the right way round? See 'SIM Card Insertion'.* *Is the gold chip visibly damaged or scratched?* Return the card to your Service Provider. *Check the SIM contacts.* If they are dirty, clean them with an antistatic cloth.

The battery won't charge	*Check the charger*. Is it properly connected? Are its contacts clean and dry? See 'Your Battery'. *Check the battery contacts.* Are they clean and dry? *Check the battery temperature.* If it is warm, let it cool before recharging. *Is it an old battery?* Battery performance will decline after several years use. Replace the battery.
The battery drains faster than normal	*Are you in an area of variable coverage?* This uses extra battery power. *Is your antenna fully extended?* This helps use less battery power. *Is it a new battery?* A new battery will need two to three charge/discharge cycles to attain normal performance. See 'Charging a New Battery' *Is it an old battery?* Battery performance will decline after several years use. Replace the battery. *Is it a battery that hasn't been completely discharged?* Allow the battery to fully discharge (until the phone turns itself off) and then charge the battery overnight. *Check that the Frequency Of Search feature in the Network Selection menu has not been set to* `Fast` *or* `Continuous`. See 'Network Search'. *Check that the Battery Saving Mode feature has not been set to* `Off`. *Are you using your phone in extreme temperatures?* At extreme hot or cold temperatures, battery performance is significantly reduced.
You can't cancel Call Diverting or Call Barring	*Wait until you are in an area with good network coverage and try again.*
The o symbol is flashing	*There is not enough memory available to store another SMS message*. Use the Messages menu to delete one or more existing messages.
I can't make international calls	*Some Service Providers automatically bar the ability to make international calls.* Contact your Service Provider. *Have you included the relevant codes?* Press and hold the 0 key to display the international dialling prefix (+) and then enter the appropriate country code followed by the phone number.

Index

A

Accessories 65
Accessory setup menu 58
Add entry
  To phone memory 31, 62
  To SIM card memory 31, 62
Adjust ring volume 47, 62
Automatic answer 58
Automatic handsfree 59
Automatic lock 48
Automatic redial 18
Auxiliary alert 59
Available networks 52

B

Bar incoming calls 42
Bar outgoing calls 41
Batteries
  Charging 11
  Charging while travelling 14
  Desktop charging 12
  Fitting 15
  Low battery warning 10
  Maintaining 11
  Removing 15
Battery charge indicator 10
Battery meter 36, 63
Battery saving mode 50
Blocked message 17, 49
Buttons
  mute 9
  SIM card release 9
  volume 9

C

Call barring 41
Call charge settings 57
Call diverting 37, 62
Call holding 40
Call metering 55
Call meters menu 55
Call related features menu 36
Call timers 56
Call voicemail 44, 62
Call waiting 40
Calling a number 18
Calling an embedded number 45
Cancel all diverting 39, 62
Capacity
  Checking battery capacity 36
  Checking Phone Book capacity 32
Cell broadcast 46
  Messages 44
Change bar password 42
Change SIM PIN2 code 49
Change unlock code 48
Characters 28
Charge meters
  Resetting 57
Charger indicators 13
Check capacity (of the Phone Book) 32

D

Data calls
- Accessories ... 65
- Diverting ... 39

Delete
- Last ten calls ... 32
- Message ... 45, 46
- Phone book entries ... 31

Desktop charging of your battery ... 12
Detailed diverting ... 38
Dialling phone book numbers ... 19
Display ... 10
Display characters ... 28
Displaying your own phone number ... 33
Divert
- All calls ... 38
- Cancelling ... 39
- Data calls ... 39
- Fax calls ... 39
- Voice calls ... 38
- When unavailable ... 38

DTX ... 50

E

Editing messages ... 44
Emergency calls ... 20
Ending a phone call ... 21
Entering characters ... 28
Erase name and number ... 31
Extended menus ... 25, 50

F

Fault finding ... 67
Fax calls
- Accessories ... 65
- Diverting ... 39

Find entry by location ... 30, 61
Find entry by name ... 30, 61
Find new network ... 54
Fitting your battery ... 15
Fixed dialling ... 33
- Calling numbers ... 33
- Setting ... 34

Flip ... 9

I

In use symbol ... 10
International phone calls ... 19

K

Keypad tones
- Selecting ... 50

L

Language selection ... 50
Last ten calls ... 32, 63
Lifetime timer ... 57
Lock now ... 48, 62
Low battery warning ... 10

M

Making a phone call 18
Master clear 51
Master reset 51
Menu navigation 23
Menus
  Accessory setup menu 58
  Call meters menu 55
  Call related features menu 36
  Extended menu 25
  Messages menu 43
  Network selection menu 52
  Options menu 35
  Personalised menus 25
  Phone book menu 27
  Phone setup menu 47
  Quick Access menu 61
  Short menu 25
Message editor 46, 63
Message settings 46
Messages 43
  Call holding/call waiting messages ...41
  Calling an embedded number 45
  Cell broadcast messages 44
  Creating and editing 44
  Reading SMS messages 44
  Sending SMS messages 45
Messages menu 43
Mute button 9
Mute car radio 58
My phone number(s) 33

N

Names
  Entering 28
Network search 53
Network selection menu 52
Networks
  Automatic search 53
  Finding new networks 54
  Manual search 53
New security code 50

O

One-touch dial setting 34
One-touch dialling 19, 62
Options menu 35
Outgoing messages 45, 63

P

Pauses
  Inserting into phone numbers 19
Personal numbers 30
Personalised menu 25
Phone book
  Call number 31
  Capacity 27
  Deleting/erasing entries 31
  Dialling phone book numbers 19
  Modify name or number 31
  Preventing access to 32
  Storing numbers - see *Add Entry* 31
Phone book menu 27
Phone calls
  Automatic redial 18
  Dialling phone book numbers 19
  Emergency calls 20
  Ending 21
  International 19
  Making 18
  One-touch dialling 19
  Receiving 21
Phone setup menu 47
Phone status 51
PIN code
  Entering 17
  Setting and changing 48
PIN2 code 49
Postscripting 27
Preferred networks 54
Prevent access (to Phone Book) 32

Q

Quick access menu 61
  Customising 64

R

Reading SMS messages 44
Received messages 45
Receiving a phone call 21
Redialling the last number called 19
Removing your battery 15
Require SIM card PIN 48
Restrict my phone number 37, 63
Return call 45
Ring or vibrate 47
Ring tones 48

S

Safety timer 59
Security code
  Changing 50
Select keypad tones 50
Sending SMS messages 45
Service centre 46
Set audible call timers 56
Set in-call display 56
Set ringer tone 48
Setup fixed dialling 34
Short menu 25
Short message service symbol 10
Short Message Services (SMS) 43
Show battery meter 36, 63
Show call charges 55, 63
Show call timers 56, 63
Signal strength symbol 10
SIM card
  Insertion 16
  PIN code 17, 48
  PIN2 code 49
  Release button 9
  Removal 16
SMS messages 43
Special keys 9
Status review 51
Symbols 10

T

Talk and fax 39, 63
Timers 56
Tones
  Selecting keypad tones 50
  Setting ringer tones 48
Transmission rate 39
Travel charger 14
Troubleshooting 67

U

Unblocking your phone 49
Unconditional call diversion 38, 62
Unlock code
  Entering 17
  Setting and changing 48

V

VibraCall 47, 63
Voicemail
  Calling 44
  Number 46
Volume
  Adjusting the earpiece and keypad volume 9
  Adjusting the ringer volume 47
  Buttons 9

W

What to do if... 67